LAKES DIAGNOSTIC STUDY

Prepared for

City of La Porte

Park and Recreation Department

By

Baetis Environmental Services, Inc.

in association with

Purdue University North Central

May 2007

EXECUTIVE SUMMARY

Urban lakes are important recreation and environmental resources to communities that are fortunate to have them. However urban settings can present challenges for protecting a lake's environmental and recreational values. This diagnostic study addresses six lakes in the City of La Porte, Indiana. The lakes studied are Pine Lake, Stone Lake, Harris Lake (also known as Hennessey Lake), Lily Lake, Clear Lake and Lower Lake. The study was sponsored by the City of La Porte Park and Recreation Department and the Indiana Lake and River Enhancement Program (LARE). The diagnostic study had multiple goals:

1. To develop information to describe conditions and trends in the major lakes in the City;

2. To evaluate La Porte's past and ongoing lake management efforts on water quality, aquatic plants and recreation;

3. To identify nonpoint source water quality problems and recommend solutions; and

4. To propose specific management actions to restore or preserve the qualities of these lakes which make La Porte a special community.

Baseline data and management recommendations derived through this diagnostic study are intended to build a scientific foundation for long-term stewardship of La Porte's lakes.

The six study lakes are kettles atop the Valparaiso Moraine. Kettles are essentially glacial melt depressions that are now lakes or wetlands. The lakes in this study have no natural drain; an artificial outlet, a siphon, was installed in the late 1990s to drain the lakes after an extended period of high water levels. Now, the lakes are in an extended period of low water levels. Both the high lake levels of the 1990s and the low water levels of today are the result of natural hydrologic cycles. The lakes have small watersheds relative to their sizes and volumes, and no natural outlet, and, when combined with several wet years or several dry years result in oscillating lake levels. The difference between the high lake levels and the low lake levels in La Porte has historically been as much as 11 feet. Understandably, this can cause difficulties for communities, properties, and infrastructure around these lakes. Current low lake levels are the result of an extended drought in La Porte County; since 1995, the area is more than one year behind in precipitation. Normal seasonal and annual fluctuating water levels are natural phenomena in the La Porte lakes and wetlands systems, and over time, these fluctuations serve to diversify habitats and vegetation communities. Fluctuations in water levels promote the interaction of aquatic and terrestrial systems, resulting in higher quality habitat and increased productivity (Wilcox and Meeker 1991). Unfortunately, water levels that are too low can lead to the temporary drying and aeration of wetland soils, loss of native hydrophytes, and spread of (exotic or native) invasive species.

Too often, Indiana lakes develop noxious algal in late summer as the result of cultural eutrophication. This excessive primary production is the response of algae to increased nutrient inputs. Eutrophication of lakes, expressed as excessive algal production, is generally driven by elevated loading of phosphorus from point and nonpoint sources in the watershed. In addition to phosphorus, other indicators of trophic status may be water transparency or chlorophyll pigments. This study devoted significant efforts to evaluate the trophic condition of each lake, mid-summer phosphorus concentrations, and sources of phosphorus nutrients to each waterbody.

Water quality sampling and testing was performed during July 2006 to assess the trophic state of each lake. During most of 2006, Lower Lake was essentially dry, limiting our ability to sample it. The LARE Program requires use of the Indiana Trophic State Index (ITSI, IDEM 1986) to assess lake trophic state. The ITSI for five of the six lakes are tabulated below. Under the ITSI system, Harris and Lily Lakes are Class II, mesotrophic to eutrophic lakes, and Clear, Pine and Stone are Class I oligotrophic-mesotrophic lakes. Harris, Lower, and Lily Lake are clearly the most productive, Lower and Harris being in late successional stages (between lakes and wetlands). Management measures for these Class II lakes should be directed at restoration and conservation of remaining high-value features. Stone and Pine Lakes are the least eutrophic and management measures should focus on protection of the resource from degradation.

Table ES-1

TROPHIC INDICATORS FOR THE SIX STUDY LAKES

Lake	ITSI	Secchi Disk Depth	Total P (mg/L)	Chlorophyll a (µg/L)
Clear Lake	12	2.0 m (79 in)	0.049	<0.50
Lily Lake	27	0.8 m (31 in)	0.070	0.57
Pine Lake	17	4.5 m (177 in)	0.105	<0.50
Stone Lake	14	4.5 m (177 in)	0.064	0.77
Harris Lake	26	0.6 m (24 in)	0.143	0.90
Lower Lake	n/a	n/a	<0.017	<0.50

Other trophic state indicators are commonly used outside of Indiana and provide an alternative trophic state evaluation of these lakes. Some limnologists for example, have categorized lake trophic state according to a single indicator, namely total phosphorus (P) concentration, as phosphorus is typically the nutrient that most limits plant and algal growth in freshwaters. Reckhow and Chapra (1983) proposed the system in Table ES-2, developed from the National Eutrophication Survey dataset. All lakes except Lower Lake would be considered eutrophic (or hypereutrophic) under Reckhow and Chapra's trophic classification system.

Table ES-2

PROPOSED RELATIONSHIPS AMONG PHOSPHORUS CONCENTRATION, TROPHIC STATE AND LAKE USE

(adapted from Reckhow and Chapra, 1983)

Total P (mg/L)	Trophic State	Lake Use
<0.01	Oligotrophic	Excellent for water-based recreation and aesthetics. Very high water clarity.
0.01 - 0.02	Mesotrophic	Suitable for water-based recreation. Clarity less than oligotrophic lakes.
0.02 – 0.05	Eutrophic	Reduced aesthetic qualities and diminished recreational value. Productive warmwater fisheries.
>0.05	Hypereutrophic	Poor clarity, high sedimentation rates, nuisance algae limit recreational and aesthetic values.

Because of phosphorus' role as the limiting nutrient, we have identified sources and estimated P loads and to each lake. Best Management Practices, or BMPs, focusing on phosphorus control, should be implemented Citywide. We have included some recommended BMPs based for public education and outreach.

In addition to measuring several water quality indicators of eutrophication, we surveyed the aquatic plant communities in all six lakes. The survey produced maps and aquatic plant management recommendations for all six lakes. Data from the surveys suggest that Pine and Stone Lakes have the highest quality communities of aquatic flora; Lily Lake has the lowest. Some Eurasian water-milfoil, an invasive exotic aquatic plant, is present in Pine Lake, and residents have been treating it recently, taking advantage of the LARE Aquatic Plant Management Program. It is important to be a vigilant monitor for this plant, and to keep it under control, not allowing it to spread it beyond its current distribution. There are occasional colonies of the exotic invasive weeds phragmites and purple loosestrife around Pine Lake which should be controlled. The City, Soil and Water Conservation District, LARE, and area NGOs can organize an "Exotic Control Day" to focus attention on and labor toward reducing the infestations of these two emergent weeds.

Pine Lake is notable for having a colony of the state-endangered *Myriophyllum tenellum* (slender milfoil). It forms substantial beds off of the point in Pine Lake and on the northeast relatively undisturbed parts of the shore. It grows in shallow water up to about three feet deep and is very susceptible to damage from personal watercraft and low lake levels. A no-wake or no boat landing zone could protect this rare plant. To this end, the City should consider petitioning the DNR to establish ecozones which would protect *Myriophyllum tenellum.* Signage could be erected identifying the plant as a protected species. A competition for school children could be held as a way to create signage and elevate awareness of this rare plant.

Bank erosion is not a problem except in the vicinity of the channel connecting Pine and Stone Lakes. In the past, a jetty was proposed on the Pine Lake side to intercept wind-driven sediment. The channel itself could be rip-rapped (or bioengineered) to stabilize eroding banks.

Clear Lake, according to the ITSI, is the least eutrophic among the study lakes. The ITSI does not however include a metric for aquatic macrophytes, which are highly productive in Clear Lake and have adversely affected the residents' use of this lake. Clear Lake has nuisance invasion of Eurasian water-milfoil. This plant covers 100% of the lake and outcompetes native plants for light, nutrients and space. The DNR has repeated in its fish management reports that control of Eurasian water-milfoil would improve the poor growth rates of panfish and reduce one contributor to winterkills in Clear Lake. In the last decade, the Park and Recreation Department has been harvesting plants from Clear Lake. While this removes phosphorus and organic material from lake and undoubtedly benefits water quality, Eurasian water-milfoil plant fragments can regenerate. Harvesting does not appear to be sufficiently controlling this nuisance. We have recommended further investigation of this issue, with considerations for a whole-lake herbicide treatment using fluridone, or use of certain leaf beetles or weevils as biological controls.

The City should continue to plant native vegetation around Clear Lake. As the recent shoreline plantings mature and begin to seed, the area can be used for seed collection to support further plantings. Roadside mowing can and should be reduced.

Stormwater nonpoint source pollution has degraded Lily Lake in recent decades. Two large culverts under Pine Lake Avenue carry stormwater from the shopping center east of Lily Lake; pollutants are transported easily and efficiently across the impervious surfaces of the parking lot and through the storm drains to Lily Lake. Preventative measures need to be taken to curb the rate of eutrophication of Lily Lake. As the impervious areas draining the shopping center and perhaps the NewPorte Landing Project, stormwater Best Management Practices (BMPs) should be installed and maintained to improve runoff quality and quantity. This is consistent with La Porte's MS4 program. BMPs will reduce nutrient loading of the lake. Potential effective BMPs might include constructed wetlands, rain gardens, pervious pavement, bioswales and infiltration basins, alum treatment and settling. The LARE Program could be approached for assistance with an engineering feasibility study of potential solutions to the stormwater pollutant loads coming from the shopping center; construction efforts might be eligible for LARE or Section 319 grant funding.

The City of La Porte is not growing significantly, and in fact is projected to slightly decline in population through the year 2030. However, tracts of former industrial properties are planned for redevelopment (i.e. NewPorte Landing) which may lead to a small population increase. Chapter 6 also presents some recommendations for low-impact, or sustainable, development and stormwater management there. Clear Lake currently receives some of the drainage from the NewPorte Landing area. Should the City redevelop drain stormwater from impervious surfaces to Clear Lake without proper treatment, it can expect Clear Lake to be adversely affected, as Lily Lake has been by the runoff of stormwater from the shopping center.

Other management recommendations include the following:

- The City should consider a carp population reduction effort for Lily Lake. The DNR Division of Fish and Wildlife can be consulted for assistance.

- Park planners should consider a boardwalk on Lower Lake off Lindewald Park. The extensive wetland provides an excellent viewing location for wildlife. It can include educational features on exotic species, biodiversity, hydrologic cycles, and water pollution. Harris Lake is also a candidate for an environmental education facility. The City could approach a local corporate or not-for-profit group to sponsor the facility.

- The City (or county) should consider preservation of any remaining undeveloped land around Pine and Stone Lakes.

- Very limited data are available on industrial contamination of the lakes. The state has issued a consumption advisory for black crappie from Stone Lake, but fish tissue from other lakes has not been analyzed. The City should ask that IDEM sample the sediments and fish of all the lakes for contaminants. Fish may present a risk to anglers opting to eat their catch. In light of the NewPorte Landing Project, we also recommend that the two small ponds there (just west of Clear Lake) be sampled and tested.

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LIST OF ACRONYMS

ANOVA	Analysis of Variance
BMP	Best Management Practice
Cd	Cadmium
CSO	Combined Sewer Overflow
DNR	Department of Natural Resources
DO	Dissolved Oxygen
EI	Eutrophication Index, now referred to as the Indiana Trophic State Index
EPA	Environmental Protection Agency
FQI	Floristic Quality Index
GIS	Geographic Information System
GPS	Global Positioning System
IDEM	Indiana Department of Environmental Management
ITSI	Indiana Trophic State Index
LARE	Lake and River Enhancement Program, DNR
LUST	Leaking Underground Storage Tank
NES	National Eutrophication Survey
NH_3	Ammonia [Nitrogen]
NO_2	Nitrite [Nitrogen]
NO_3	Nitrate [Nitrogen]
NPDES	National Pollutant Discharge Elimination System
NIRPC	Northwestern Indiana Regional Planning Commission

LIST OF ACRONYMS (CONT'D)

NURP	National Urban Runoff Program
QAPP	Quality Assurance Project Plan
P	Phosphorus
Pb	Lead
PNC	Purdue University North Central
STORET	STOrage and RETrieval Database of the EPA
SWCD	Soil and Water Conservation District
TMDL	Total Maximum Daily Load
TSS	Total Suspended Solids
UST	Underground Storage Tank
Zn	Zinc

GLOSSARY

Alum – A variety of aluminum sulfate used in water treatment to coagulate raw water in the purification process. It is also used in lake management and wastewater treatment to remove phosphates from the water.

Analysis of Variance - In statistics, ANOVA, is a collection of models, and their associated procedures, in which the observed variance is partitioned into components due to different explanatory variables. One-way ANOVA is used to test for differences among three or more independent groups. Factorial ANOVA is used to assess the effects of two or more treatment variables.

Aquifer - an underground layer of water-bearing permeable rock or unconsolidated materials.

Best Management Practices - structural and nonstructural stormwater management controls that reduce changes to both quantity and quality of runoff caused by changes in watershed land use.

Coliform bacteria - a bacterial indicator of sanitary quality of water. Coliforms are abundant in the feces of warm-blooded animals (mammals and birds), but can also be found in the aquatic environment, in soil and on vegetation.

Correlation coefficient – a number representing the strength and direction of a linear relationship between two random variables. In general statistical usage, correlation refers to the departure of two variables from independence, although correlation does not imply causation.

Ecotoxicology – the science involving the prediction of the effects of contaminants upon natural communities, populations and individuals.

Epilimnion - the top-most layer in a thermally stratified lake, occurring above the metalimnion and the deepest layer, the hypolimnion. The epilimnion is warmer and typically has a higher pH and dissolved oxygen concentration than the hypolimnion.

Eutrophication – a condition caused by the increase of chemical nutrients, typically compounds containing nitrogen or phosphorus. Eutrophication is frequently a result of pollution such as the release of sewage effluent into natural waters although it may also occur naturally in situations where nutrients accumulate or where they flow into systems on an irregular basis. Eutrophication generally promotes excessive plant growth and decay, favors certain weedy species over others, and is likely to cause severe reductions in water quality.

Hydrophytic vegetation - macrophytes occurring in areas where the frequency and duration of inundation or soil saturation exert a controlling influence on the plant species present.

Hypolimnion - the bottom layer of a stratified lake containing the coldest and most dense water, lying below the thermocline.

Kettle lake – a lake formed from blocks of ice calving from the front of a receding glacier and buried by glacial outwash. When the ice blocks melt, holes are left that fill in with water to become lakes or wetlands.

Macroinvertebrate - aquatic invertebrates including insects, crustaceans, molluscs and worms which inhabit a stream, lake or wetland. Macroinvertebrate abundance and diversity are an indicator of ecosystem health and an important component of the food chain.

Macrophytes - aquatic plants, growing in or near water, and may be emergent, submergent, or floating.

Metalimnion - a layer within a lake where the temperature changes rapidly with depth (see also thermocline).

Moraine – a glacially formed accumulation of unconsolidated debris.

Oligotrophic lake – a lake of low organic productivity, generally characterized by low nutrient concentrations, clear water, low plankton concentrations and low settling rates.

P-value – In statistics, the p-value is the probability of obtaining a result at least as extreme as a given data point, assuming the datum was the result of chance alone.

Pan evaporation - a measurement that integrates the effects of several climate elements: temperature, humidity, solar radiation, and wind. It is measured using a Class A evaporation pan. There is a correlation between lake evaporation and pan evaporation. Evaporation from a natural body of water is usually at a lower rate because the body of water does not have metal sides that get hot with the sun.

Phytoplankton - the photosynthetic plankton that drift in the lake water, and, in high numbers, can turn the lake green. Most phytoplankton are too small to be individually seen with the naked eye.

Sewershed - Analogous to a watershed, where all the water in a region of land drains through underground artificial conduits to a specified body of water, such as a detention pond or stream.

Thermal stratification – In the context of a lake, seasonal differences in solar energy and wind mixing cause division of the lake into distinct layers, each with specific properties such as temperature, density or dissolved oxygen concentration (see also epilimnion, hypolimnion and metalimnion).

Thermocline - Sometimes referred to as the metalimnion, the thermocline is a layer within a lake where the temperature changes rapidly with depth.

Watershed - the region of land where all water drains into a specified body of water, such as a lake.

Winterkill – a form of oxygen depletion that occurs during winter. Ice and snow cover the lake or pond and prevents oxygen exchange at the water surface as well as photosynthesis. This leads to the demand for oxygen exceeding the supply, and fish die from lack of oxygen.

Zooplankton – the heterotrophic (or detritivorous) members of the plankton in lakes.

ACKNOWLEDGMENTS AND CREDITS

The authors gratefully acknowledge the support and assistance of the City of La Porte and the Indiana Department of Natural Resources' Lake and River Enhancement Program. Baetis was assisted by two outside contractors. Purdue University North Central performed the biological field investigations and spent many long days in the field performing the aquatic plant surveys. Purdue personnel included Dr. Robin Scribailo, Dr. Mitch Alix, and Ms. Mandy Lakatos. Chemical analyses were performed by Severn Trent Laboratories of Valparaiso, Indiana.

1.0 INTRODUCTION

La Porte is the county seat of La Porte County, Indiana. The six lakes in this study are located on the north side of La Porte, in Center Township (Figure 1). The diagnostic study lakes are Stone, Pine, Lily, Harris (also known as Hennessey Lake), Clear and Lower Lakes. All six lakes are accessible by the public through the park system properties.

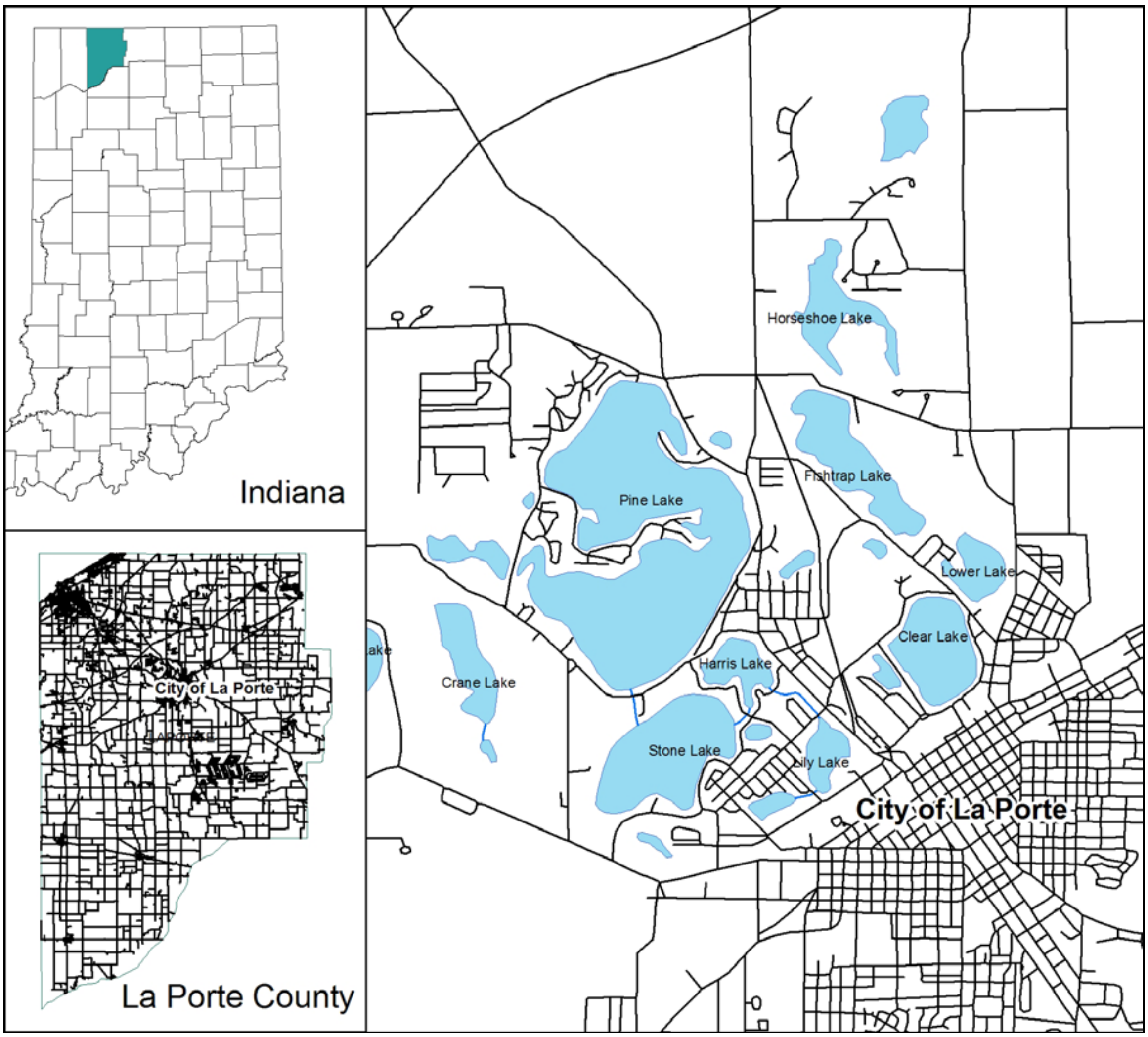

Figure 1. Location Map

1.1 Purpose and Scope

In 2005, the Indiana State Soil Conservation Board approved a grant to the City of La Porte under the DNR's Lake and River Enhancement Program. This is the third grant the City has received under this program. While previous grants were specific to Clear Lake, the latest grant is to perform a diagnostic study of Pine, Stone, Harris, Lily, Clear, and Lower Lakes. The diagnostic study has multiple goals:

1. To develop information which describes conditions and trends in the major lakes in the City of La Porte;

2. To evaluate La Porte's past and ongoing lake management efforts on water quality, aquatic plants and recreation;

3. To identify nonpoint source water quality problems and recommend solutions; and,

4. To propose specific lake management actions to improve the quality of life in La Porte, both environmentally and socially.

Recommendations will build a scientific and regulatory foundation for long-term stewardship of La Porte's lakes.

1.2 Cultural Setting

The 2000 U.S. census reports that the population of La Porte County was 110,106. Center Township, with 24,405 residents, includes the six lakes in this study. Center Township is second in population behind Michigan Township (Exhibit 1). There are 9,723 households in Center Township, and about two-thirds of these own their homes.

In the City of La Porte, the 2000 census recorded 26,356 residents. The Northwestern Indiana Regional Planning Commission has projected the City population to decrease to 25,551 by 2030 (NIRPC 2006). Median household income in the City of La Porte was $35,376 in 2000, compared to a county-wide median household income of $41,430.

There are more than 35 lakes in La Porte County (Figure 2). The majority of the lakes are in the northern half of the county generally in an arc that follows the Valparaiso Moraine. In addition to Lake Michigan, the abundance of inland lakes offers residents and visitors a bounty of water-based recreation and wildlife habitat. According to the US Geological

Survey's Geographic Names Information System, Center Township has ten named lakes, more than any other township in the county.

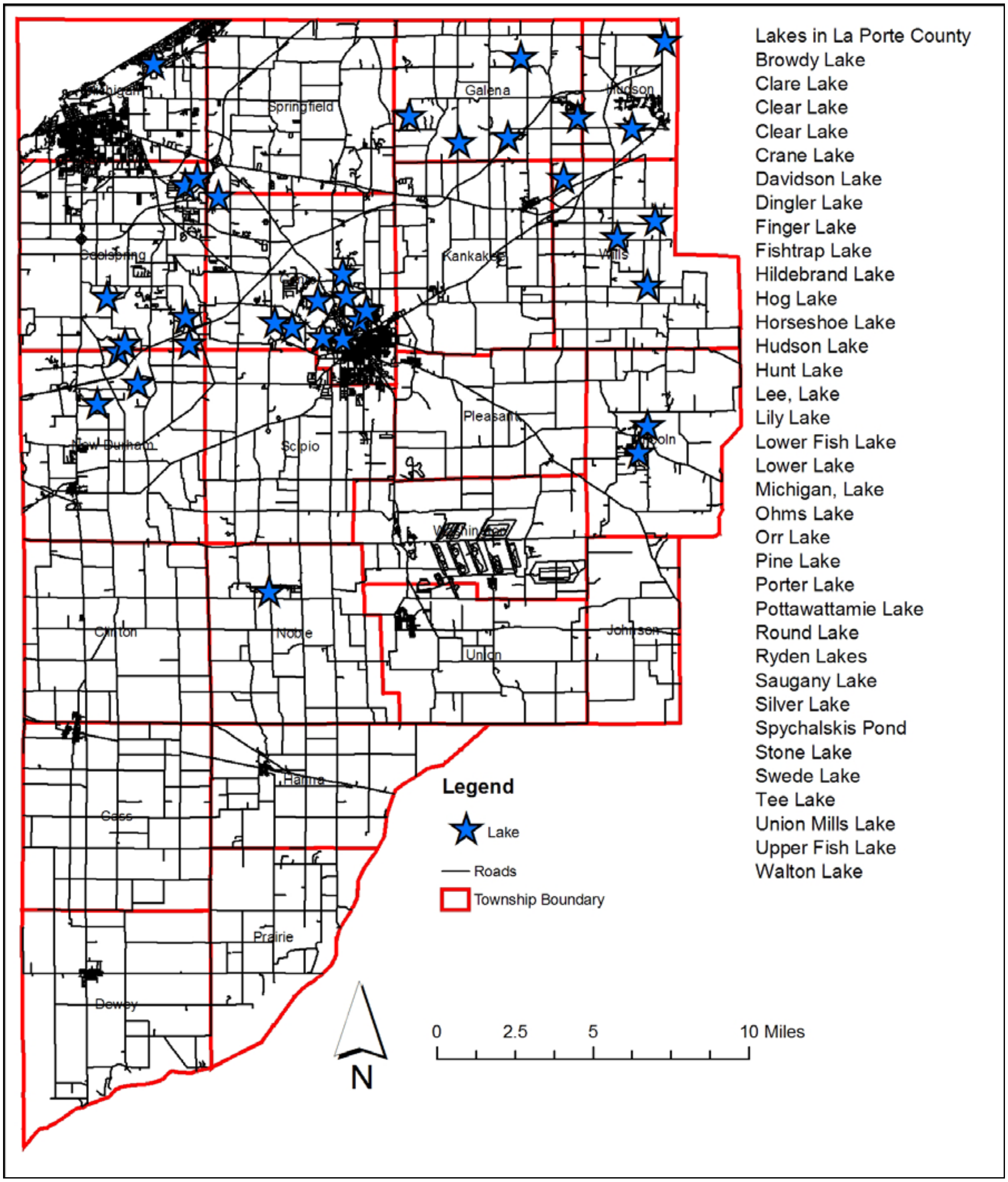

Figure 2. Lakes in La Porte County

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2.0 WATERSHED CHARACTERISTICS

This chapter details the environmental features in the 11.7-square mile study area. Figure 3 overlays shaded areas for each lake's individual drainage area onto the US Geological Survey's 7½-minute topographic maps.

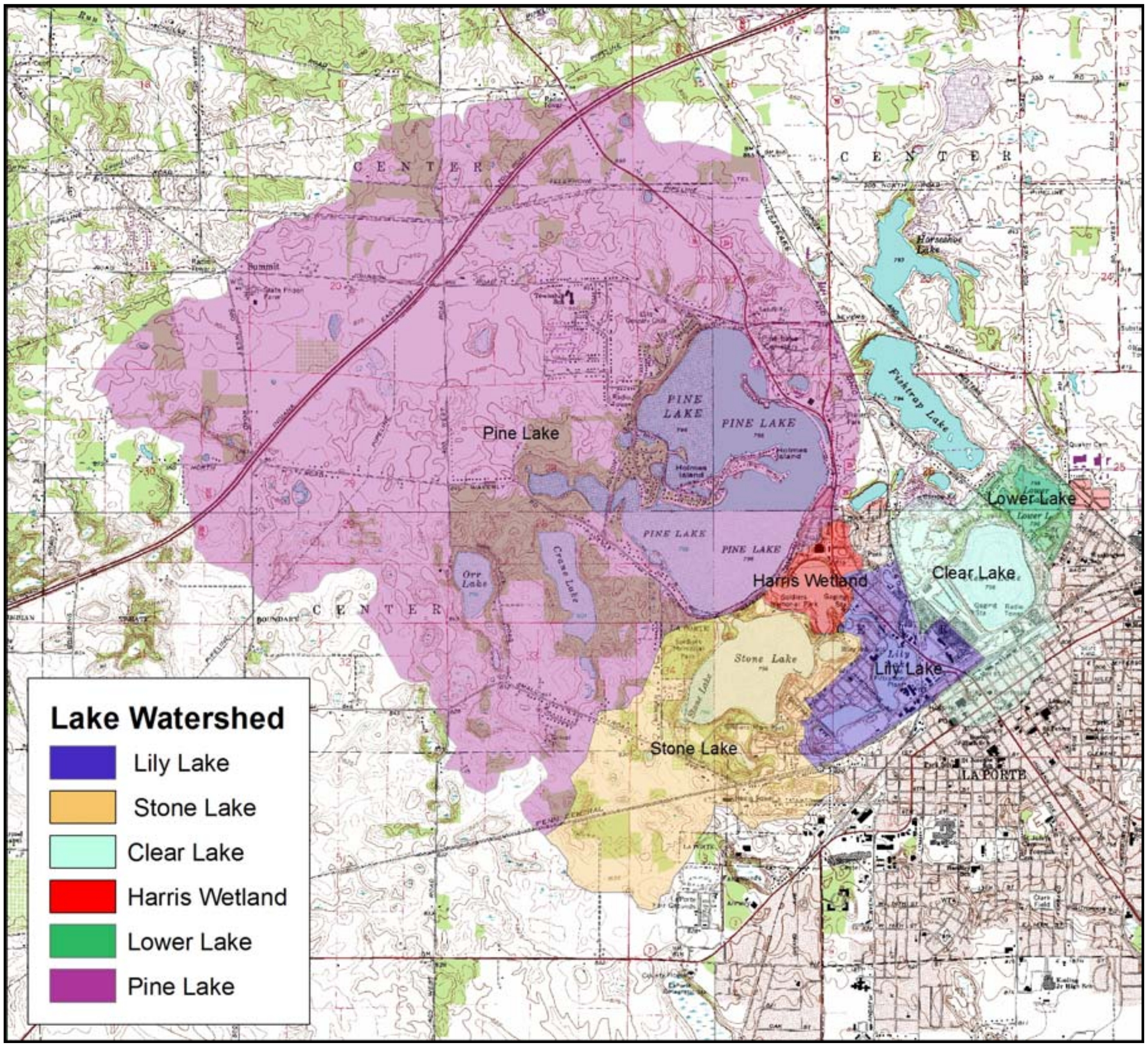

Figure 3. Watersheds of the Study Lakes

2.1 Physiography

The City of La Porte lies on the northern border of the Kankakee River basin, in the Northern Lake and Moraine Region, along the Valparaiso Moraine (Mallott 1922). In La

Porte County, the Valparaiso Moraine is essentially a ridge with maximum elevations varying from about 800 feet to 950 feet (245 to 290 m) near Springville. Lakes in the county are concentrated along the morainal ridge.

The topography and geology of the moraine controls the lakes and the storage of water because it largely determines the topography, soils and aquifers in La Porte. Much of the study area does not contribute to Kankakee River flows under normal hydrologic conditions. The lakes of Center Township are glacial depressions (kettles) that only discharge to the south (Kankakee River basin) when water levels are high and the Lily Lake siphon is functioning.

Figure 4 is a modification of a regional elevation model. The darkest areas represent the highest elevations. Note that the highest elevations nearly encircle the lakes (shown in white). Normal lake levels are around 796 ft (242.5 m); all land surrounding the lakes is higher ground (Figure 4) and as a consequence, the lakes have historically fluctuated with precipitation trends. This is discussed in more detail in subsequent sections of this chapter, and, has significant implications for lake water quality. Because there is no natural outlet of the lakes (except seepage to groundwater and evaporation), all pollutants entering the lakes remain there. No flushing occurs in any of the six lakes.

2.2 Climate

La Porte has the hot, humid summers and cold winters associated with the continental climate, but is locally affected by Lake Michigan. Climatic modifications are most pronounced within a mile to two of Lake Michigan, but can extend inland as far as La Porte and South Bend. This results in La Porte having warmer falls, cooler springs, higher annual precipitation, and increased winter cloudiness and snowfall than the region in general. In Indiana’s “snowbelt”, La Porte gets as much as 30 to 50 percent of its annual precipitation as snow between the months of November and May. Table 2-1 provides precipitation statistics from a weather station in La Porte having monthly records back to 1948. Table 2-2 provides monthly means for temperature, precipitation and pan evaporation means for a shorter period of record. Pan evaporation is a standardized weather measurement that integrates the effects of temperature, humidity, solar radiation, and wind. This standard measure is usually greater than evaporation from a lake surface, essentially due to the insulating effects of the earth and vegetation on lake evaporation in comparison to the “pan” used to measure pan evaporation. The Indiana DNR reports that average annual lake evaporation can be estimated as 70% of pan evaporation, which for the lakes in La Porte, would average 29.8 inches annually.

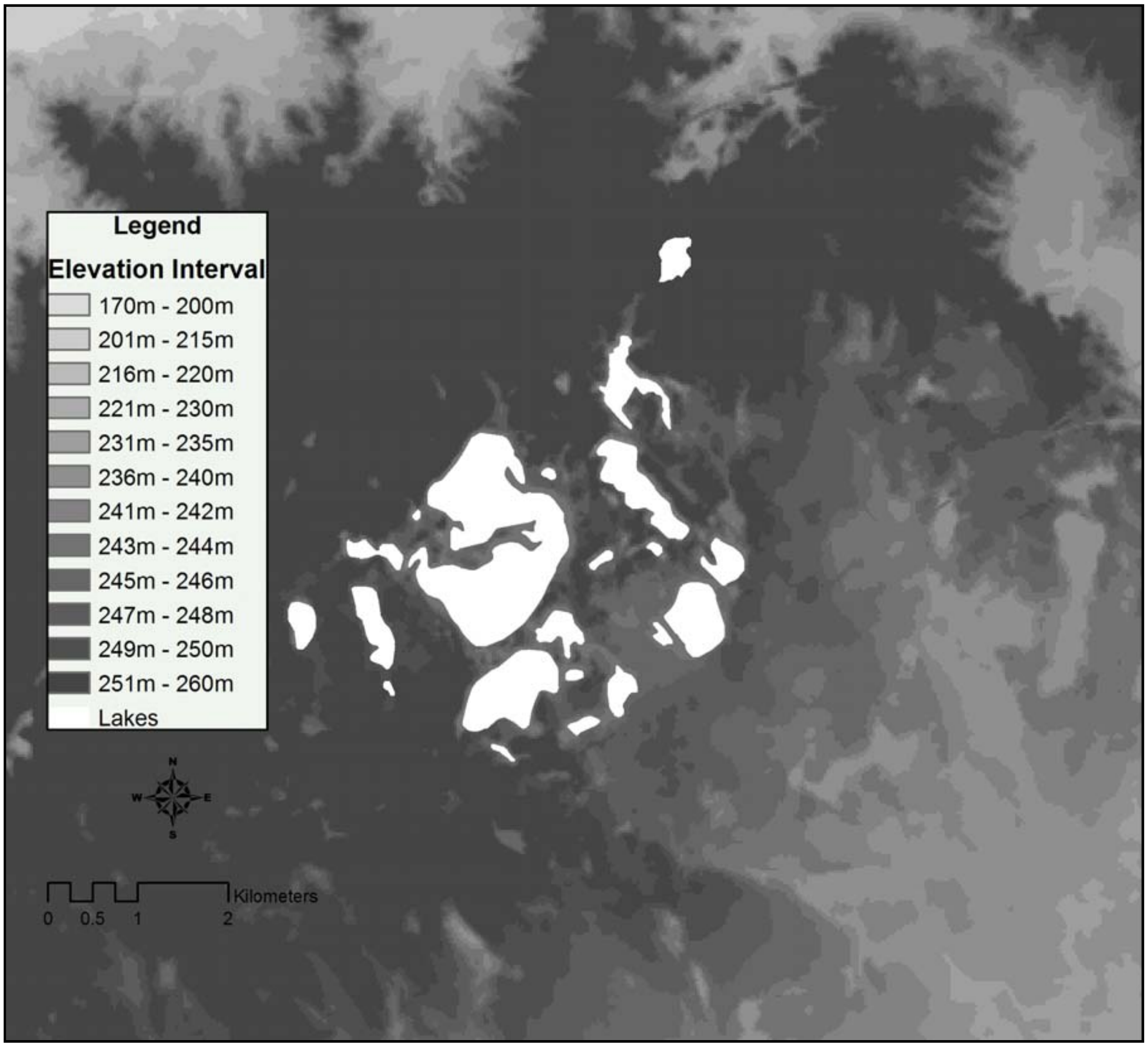

Figure 4 Regional Elevation Map

Table 2-1

LA PORTE PRECIPITATION SUMMARY STATISTICS

(in inches)

Variable	N	Mean	Standard Deviation	Minimum	Maximum
Monthly	695	3.51	2.01	0.18	18.26
Annual	57	41.72	8.60	30.59	70.98

Table 2-2

CLIMATE IN LA PORTE COUNTY

Month	Mean Temperature (F)[†]	Monthly Precipitation (in)[†]	Pan Evaporation (in)[*]
January	22.9	2.3	0.83
February	27.3	1.91	1.00
March	37.7	3.05	2.08
April	48.6	3.54	3.80
May	60.2	3.48	5.63
June	69.4	4.44	6.73
July	73.6	3.79	6.64
August	71.6	4.18	5.93
September	64.3	3.88	4.26
October	52.7	3.23	3.17
November	40.1	3.79	1.61
December	28.4	3.24	0.88
Annual	49.7	40.83	42.56

[†] Data for La Porte, 1971 to 1990, from Indiana State Climate Office, http://shadow.agry.purdue.edu/sc.index.html

[*] Data estimated for South Bend, 1956 – 1970, from IDNR (1990)

2.3 Hydrology and Hydrogeology

La Porte and the lakes are situated on the southeastern slope of the Valparaiso Moraine. They lie on the Valparaiso Collapsed Fan (Figure 5), on a broad apron of permeable sand and localized gravels left from the retreat of the last glacier. A veneer of till generally overlies the outwash on the moraine crest. In the area around the City of La Porte, the topography is irregular, with numerous muck and peat-filled basins of internal drainage.

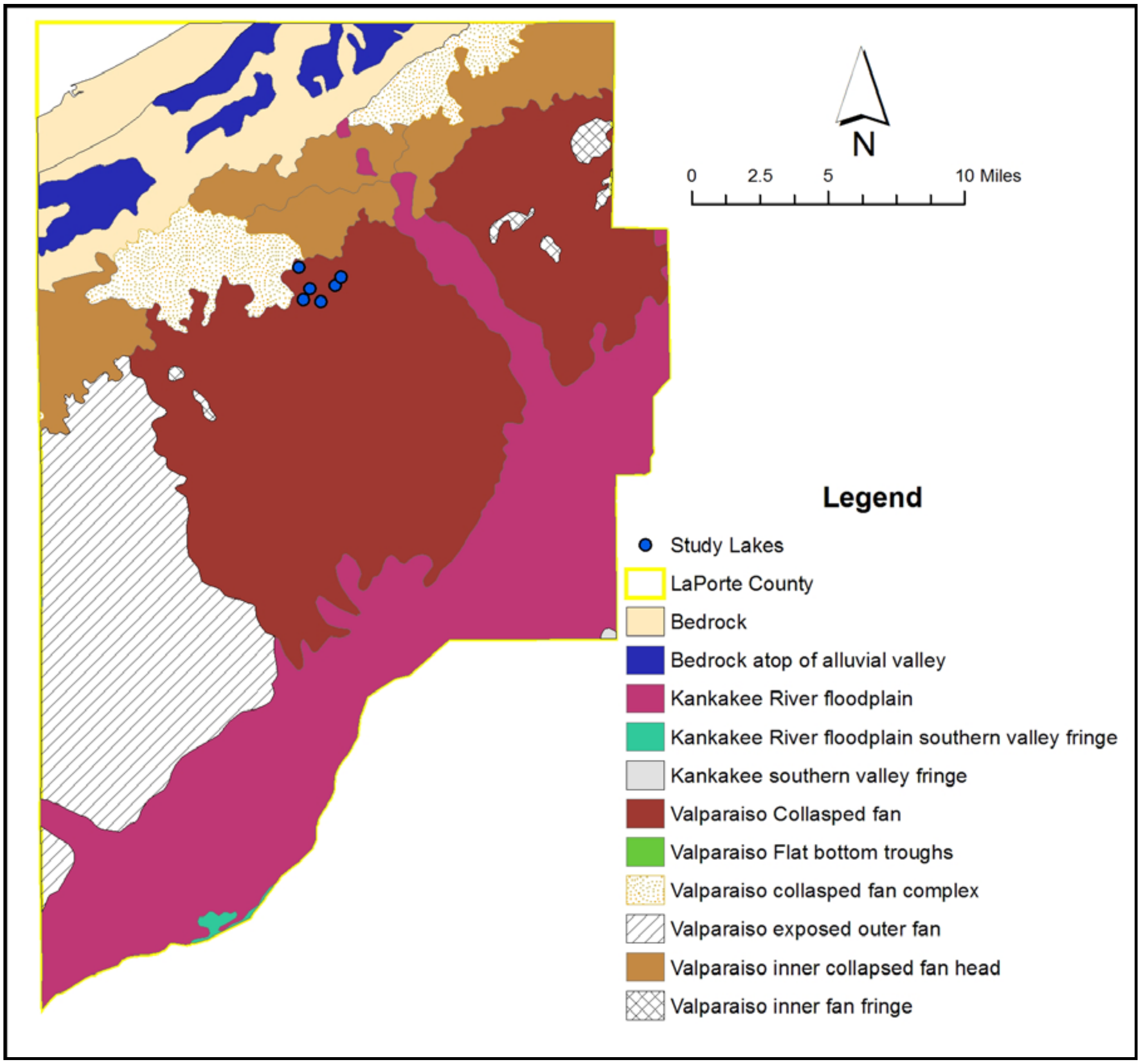

Figure 5. La Porte County Geology

This internal drainage is an overwhelming factor controlling the water and nutrient budgets of the lakes in La Porte. All the lakes (and most wetlands as well) are kettle lakes, that is, they are the result of ice-block depressions formed during the last glacial period. Until the siphon at Lily Lake was constructed in the late 1990s, the lakes had no outlets, and rose and fell by as much as eleven feet (Table 2-3). Surface water, and all pollutants, stay in the lakes (except for seepage to groundwater and evaporation), unless the siphon is operating. This results in a general lack of flushing for removal of nutrients, heavy metals, or other pollutants from the lakes in La Porte. All pollutants entering the lakes essentially become available to the system for annual cycling in the aquatic trophic web; La Porte residents should therefore be particularly conscientious about preventing pollutants from leaving their properties with storm runoff.

Table 2-3

PINE LAKE LEVEL SUMMARY STATISTICS, 1895 TO 2006 (in feet)

(Data Source: City of La Porte)

Mean lake level	795.63
Standard Error of Mean	0.08
Median	795.55
Maximum lake level	800.9
Minimum lake level	789.92
Number of monthly observations	896

Prior reports by the Indiana DNR (1982, 1990) provide general information on local hydrogeology. The lakes are essentially located at the drainage divide of the lower glacial aquifer. The lakes are a significant part of the aquifer recharge system. Being at the top of the divide, groundwater tends to move radially out from the lakes. An older reference, (Mallott 1922) refers to the lakes as a source of springs that emerge on the northern slope of the Valparaiso Moraine, and serve as headwaters of Trail Creek.

Pine, Harris, Stone and Lily Lakes are connected and have the same surface elevation. Records of the lake levels have been kept since 1895, and are summarized in Table 2-3 and below. All six lakes in this study likely have similar levels, although no recordings are available for Clear or Lower Lake. There are surface connections between Pine, Harris, Stone and Lily Lakes. Clear and Lower Lakes undoubtedly have subsurface connections, and there is a storm sewer connecting Lily and Clear Lakes. The six lakes are likely at or near the same levels and respond similarly to long-term precipitation trends and groundwater levels. Legal lake levels are however different. Clear Lake's legal elevation is 798.20 ft. The Pine, Harris, Stone and Lily Lake-complex has a legal level established at El. 796.20 ft, well above its average. In August 2006 Pine, Stone and Lily Lakes were at El. 793.27 ft.

Figure 6 is a cumulative distribution function assembled from the City's long-term lake level records. Figure 4 indicates that, over the period of record, Pine, Stone and Lily

Lakes have been at or below the legal level about 57% of the time. In other words, the median lake level is below the legal lake level.

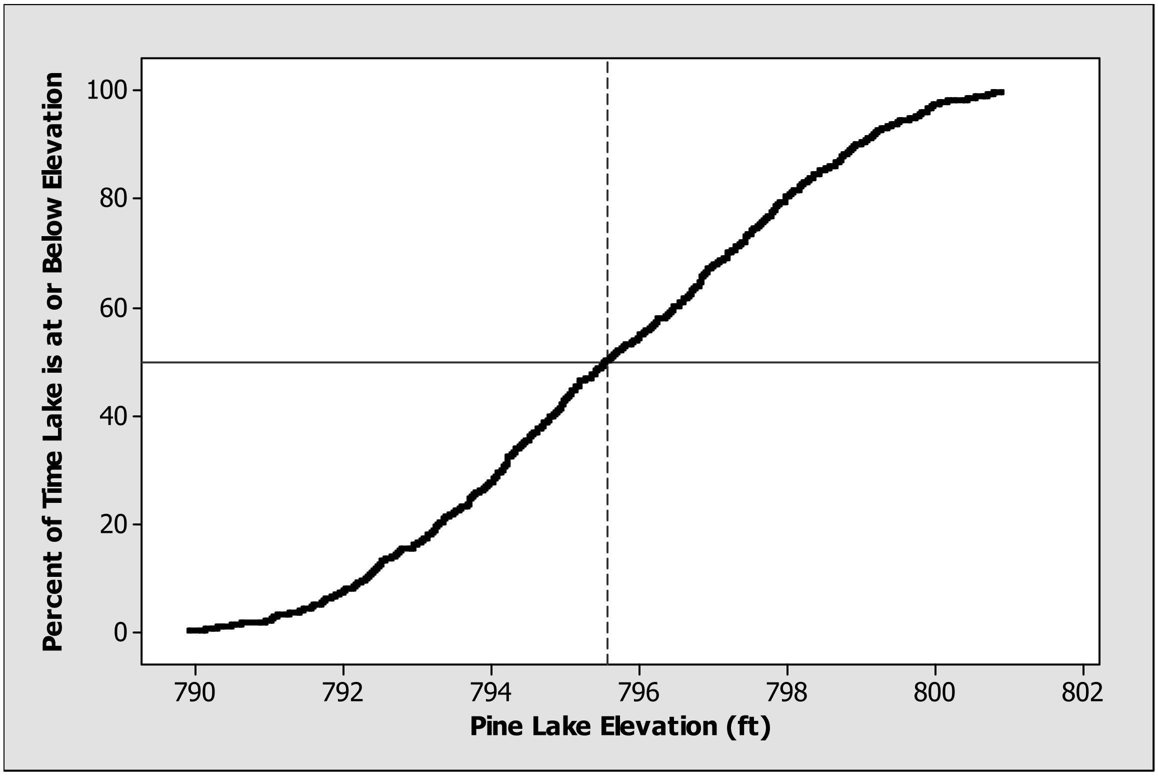

Figure 6. Pine Lake Water Elevation Cumulative Distribution Function

During the course of this diagnostic study, concerns have been voiced about the current low lake levels in La Porte. This is a result of climatic conditions; ten of the last 12 years have been below normal precipitation in La Porte. Hudson Lake, also in La Porte County, has recently been awarded a LARE grant to investigate, among other things, low lake levels there.

In an effort to address local concerns regarding the current low lake levels, Baetis attempted to obtain sufficient data on precipitation, lake levels and groundwater levels for an analysis of trends and correlations (Appendix A). From data provided by the City, we assembled a time series plot of lake level and monthly precipitation (Figure 7). Pine, Stone and Lily Lakes have fallen steadily since 1994, from El. 800+ ft to 793+ ft in 2005. During this 12-year period, La Porte received significantly below normal precipitation, and accumulated a precipitation deficit of 37 inches, or about 7.4% annually. The cumulative deficit in precipitation mirrors the drop in lake levels; we found a strong correlation between lake levels and cumulative precipitation deficits (Pearson correlation coefficient = 0.938, P-value = 0.000+, Figure 8).

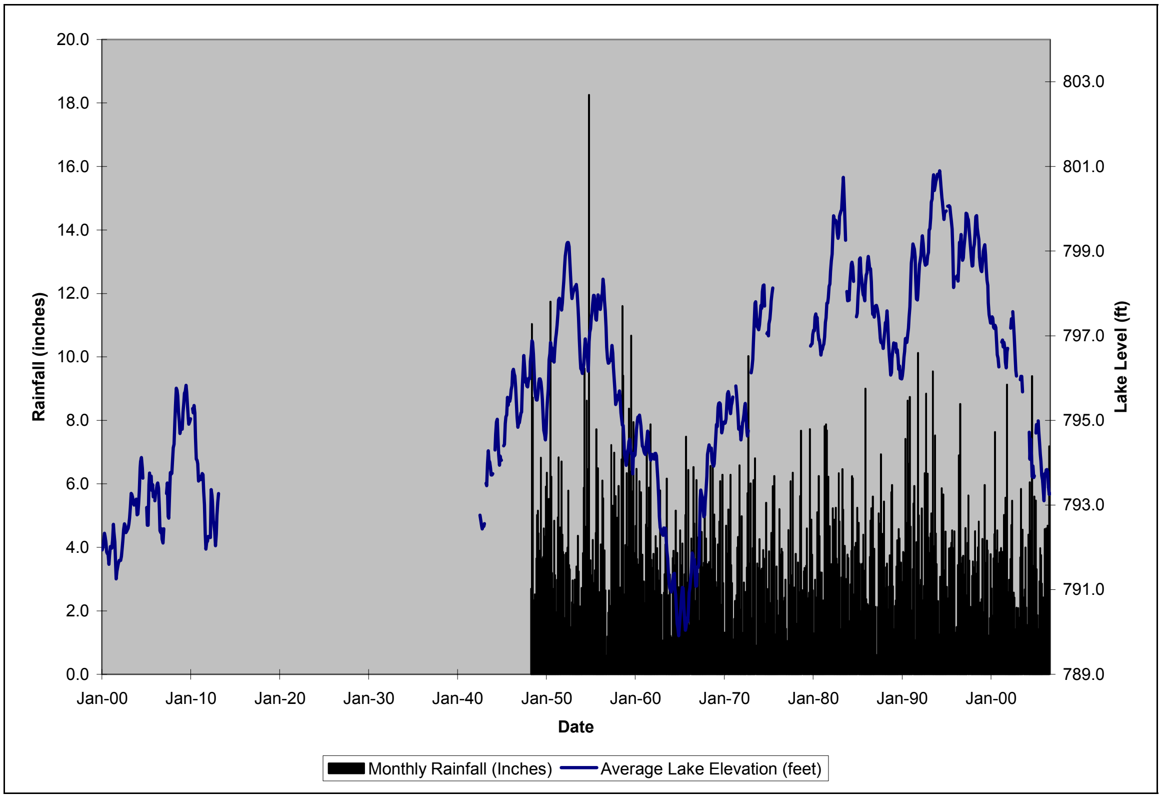

Figure 7. Pine Lake Level and Monthly Precipitation

Extended periods of low lake levels are not unprecedented in La Porte. In the 1960s, the lakes reached as low as El. 789.9 ft (Figure 7).

Other potential sources of water loss from the lakes include:

- Groundwater table lowering because of increased pumpage from City wells
- Diversion of surface runoff from the watersheds
- Artificial drainage

Unfortunately, data on shallow groundwater levels in the vicinity of the lakes are not available. The City pumps from deep wells. The amounts of groundwater that the City of La Porte pumps have been constant or declining since 1990. Monthly water production data did not correlate with lake levels. The City's utilization of groundwater for water supply is not likely the cause of current low lake levels. We are not aware of surface water diversions that would affect lake levels either. The only mechanism of artificial drainage is the Lily Lake siphon, which has not operated in recent years. Therefore, it is our opinion that current low lake levels are associated with less than normal precipitation since 1994. La Porte is, in essence, one full year behind in precipitation necessary to restore lake levels to normal.

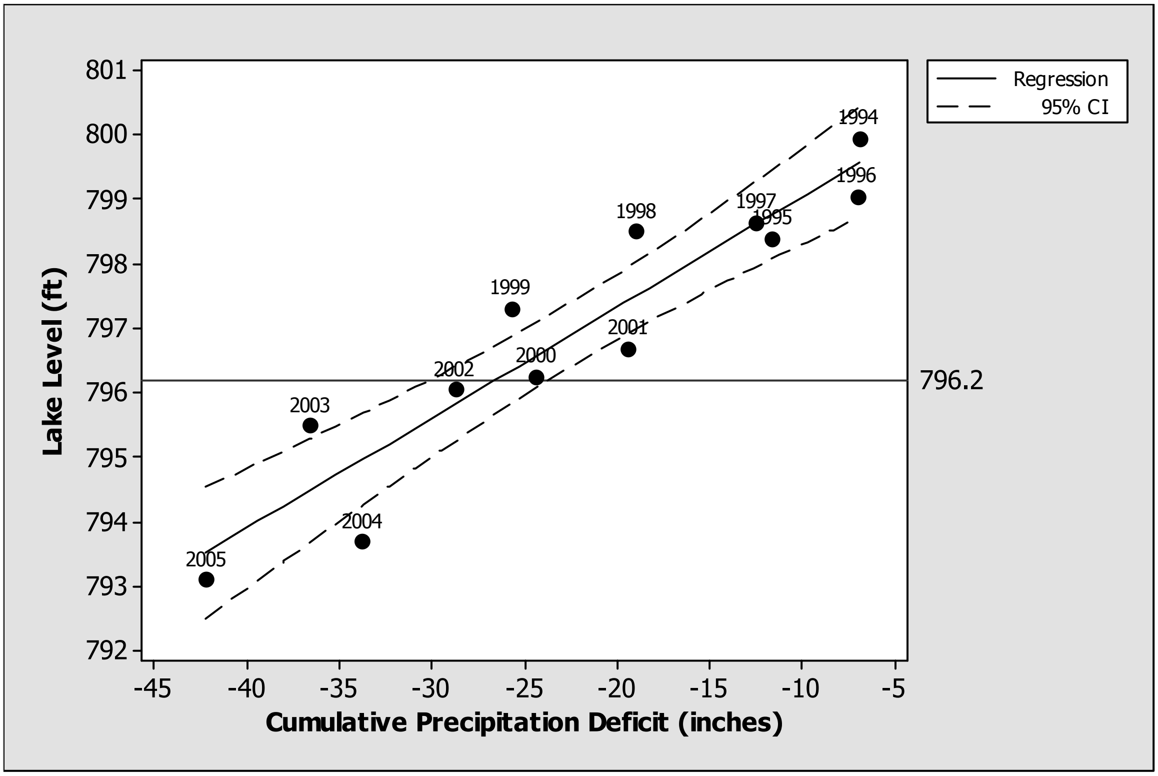

Figure 8. Cumulative Precipitation Deficit Versus Lake Level

2.4 Soils

Soils data for the study area were obtained from the Natural Resources Conservation Service's Soil Survey Geographic (SSURGO) database (available for downloading, http://www.ncgc.nrcs.usda.gov/products/datasets/ssurgo/). The tabular and spatial data were processed to extract information on the study watershed (Exhibit 2). The principal soil units in the study area include Tracy sandy loam, Riddles loam, and Urban-land Coupee complex. Minor inclusions of other units are also present.

Tracey sandy loam soils, including units TcA, TcB, TcC2, TcD2, and TcF, are well drained. The watertable is at a depth greater than 40 inches (1 m). These soils are on backslopes, shoulders, and summits on the outwash plains. Slopes range from 0 to 1 percent in TcA to 25 to 45 percent in TcF. Units TcC2, TcD2, and TcF are considered highly erodible by nature of their higher slopes. The native vegetation is hardwoods. The surface layer is sandy loam and has moderately low organic matter content (1 to 3 percent). Permeability is moderate (0.6 to 2 in/hr, 15 to 50 mm/hr) in the most restrictive layer above 60 inches (1.5 m). The pH of the surface layer in non-limed areas is 4.5 to 5.0. Doughtiness is a management concern for crop production.

Riddles loam soils in the watershed include units RlA, RlB2, RlC2, RlD2, and RlF. These soils are well drained and the watertable is at a depth greater than 40 inches (1 m). These soils are on moraines, and slopes range from 0 to 2 percent in RlA to 25 to 45 percent in RlF. Units RlC2, RlD2, and RlF are considered highly erodible by nature of their higher slopes. The native vegetation is hardwoods. The surface layer is loam and has moderately low organic matter content. Permeability is moderate (0.6 to 2 in/hr, 15 to 50 mm/hr) in the most restrictive layer above 60 inches (1.5 m). The pH of the surface layer in non-limed areas is 4.5 to 7.3.

The urban land soils are areas that have been disturbed by man and are therefore highly variable in their properties. Most areas are covered by structures or roads. The Coupee soils are well drained and the watertable is deeper than 40 inches (1 m) below the surface. Coupee soils are on summits, shoulders, and backslopes on outwash plains. Slopes are 0 to 1 percent. The native vegetation is also hardwoods. The surface layer is silt loam and has moderate organic matter content (2.0 to 4.0 percent). Permeability is moderate (0.6 to 2 in/hr, 15 to 50 mm/hr) in the most restrictive layer above 60 inches (1.5 m). Available water capacity is moderate (8.6 inches in the upper 60 inches). The pH of the surface layer in non-limed areas is 5.1 to 7.3.

Highly erodible lands are shown in red in Figure 9. Highly erodible land means land that has an erodibility index of 8 or more. An erodibility index expresses the potential erodibility of a soil in relation to its soil loss tolerance value without consideration of applied conservation practices or management. These lands are eligible for special soil conservation assistance from state and federal agencies.

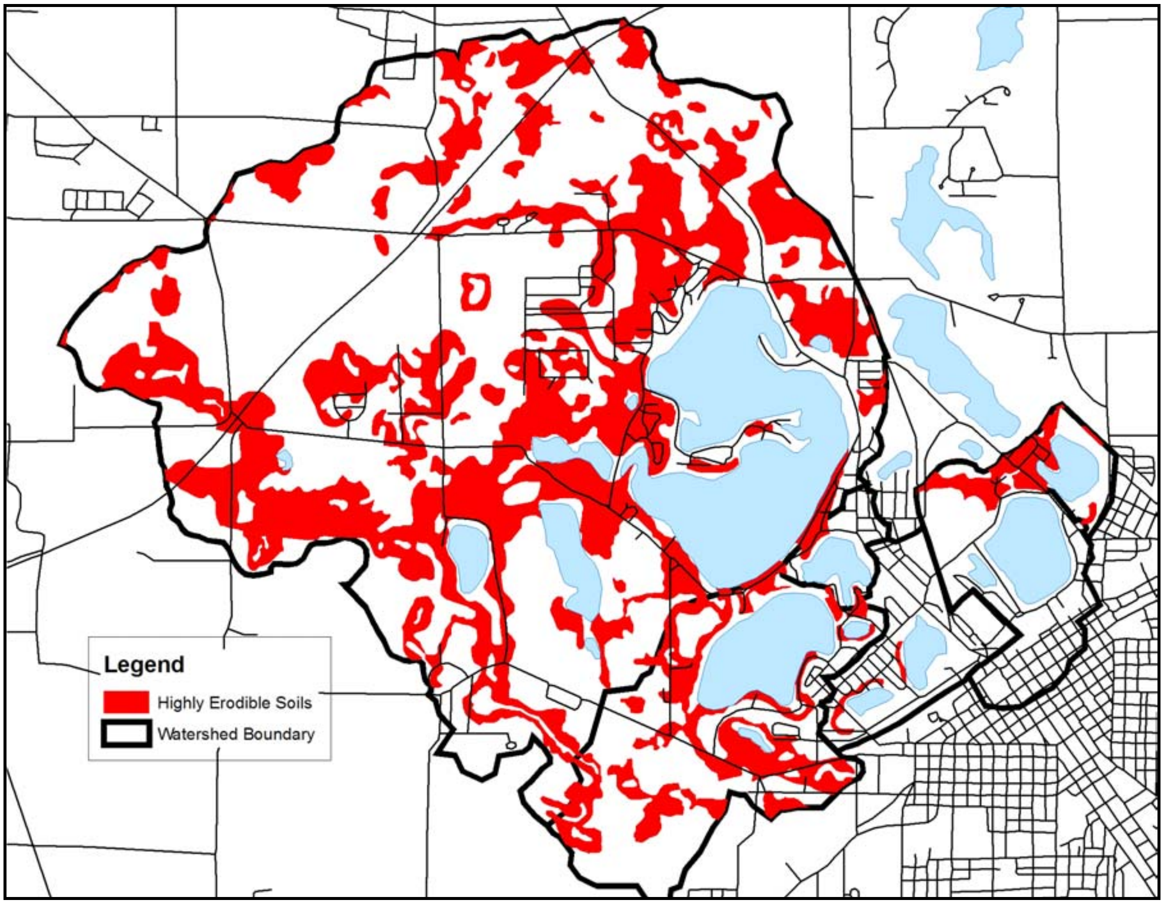

Figure 9. Highly Erodible Lands in the Study Area

Notice the proximity of HEL to Pine and Stone Lakes, placing these lakes at risk if proper erosion controls are not practiced on private (and public) properties. Fox Park, just of Clear Lake, also contains HEL and warrants appropriate conservation measures for park construction and maintenance.

2.5 Land Use and Cover

Land use data for the study area were downloaded from the Indiana Geological Survey website (http://129.79.145.7/arcims/statewide_mxd/dload_page/environment.html). These data are from 1992, the most recent year available for this type of information, and are based on 30-meter-resolution (98 ft) Landsat thematic mapper data. Pixel classification includes 18 categories of land use. This grid is a subset of the National Land Cover Data set, Version 06-03-99, of the U.S. Geological Survey.

The watershed includes 12 of the 18 categories of land use/land cover. Table 2-4 summarizes land use in the subwatersheds; Exhibit 3 contains additional data on land use and cover.

Table 2-4

1992 LAND USE/COVER IN LAKE SUBWATERSHEDS

Land Use / Cover	Clear	Lower	Pine	Harris	Stone	Lily
Open Water	31%	6%	12%	24%	21%	11%
Low Intensity Residential	5%	18%	6%	13%	10%	10%
High Intensity Residential	8%	15%	1%	12%	5%	21%
Commercial/Industrial/Transportation	32%	0%	1%	10%	1%	37%
Deciduous Forest	6%	8%	17%	8%	15%	6%
Evergreen Forest	5%	8%	11%	5%	12%	4%
Upland Grasses & Forbs	2%	2%	4%	0%	1%	0%
Pasture/Hay	1%	4%	18%	0%	5%	0%
Row Crops	3%	2%	21%	2%	21%	0%
Urban/Recreational Grasses	4%	1%	2%	1%	3%	2%
Woody Wetlands	2%	1%	4%	5%	3%	3%
Emergent Herbaceous Wetlands	1%	35%	4%	20%	3%	6%

It is notable that approximately one-third of the area draining to Clear Lake or to Lily Lake is developed for commercial, industrial, or transportation purposes. This land use is highly impervious, with high runoff coefficients and pollutant wash-off rates. This has important implications for lake water quality, especially Lily Lake, which does not have the alum treatment system/sedimentation basin that Clear Lake has. This is discussed further in the following chapters.

2.6 Stormwater Management

The City of La Porte is only partially served by separate sewers. Malcolm Pirnie (2005) estimated that combined sewers serve about 16,658 residents, or 77 percent of the population. La Porte has a single CSO (combined sewer outfall) discharge point located at the south eastern edge of a 17-acre (6.9 ha) CSO storage lagoon at the City wastewater treatment plant. The CSO outfall is outside of the lakes watersheds.

Five La Porte County Rule 13 communities have banded together for permitting and compliance purposes (Permit No. INR040107). Many of the recommendations coming from this lakes diagnostic study support the intent of Rule 13 and the City's stormwater management program.

Baetis endeavored to find data on the locations and drainage areas of separate storm sewers discharging to the study lakes. A comprehensive dataset was not available for this purpose. We compiled data from a variety of sources, sometimes contradictory in nature. Baetis also conducted limited field surveys to confirm known outfall locations and to locate heretofore undocumented outfalls. Figure 10 shows locations. Exhibit 4 contains more detailed information on storm outfalls. Baetis found 31 outfalls, but there are undoubtedly others. Clear Lake has the most storm sewer outfalls in this dataset, but all except two of these pipes are very small (≤8 inches, ≤20 cm).

We also digitized the drainage areas of the larger sewers in the study area. The sewersheds were defined using a sewer atlas provided by the City of La Porte and topographic maps from the US Geological Survey. Table 2-5 provides information derived from these sources on selected storm sewersheds in the study area. The drainages are depicted in Figure 11. The storm drain leading to the Clear Lake alum system and sediment trap is the largest storm sewershed in the study area. This sewershed drains a large portion of downtown La Porte. Soft sediment has accumulated in this trap since its reconstruction under the LARE Program in 1999. We measured 261 yd^3 of sediment (200 m^3) in the trap in May 2006 (see Section 5.1.3).

Figure 10. Stormwater Outfalls in the Study Area

Storm runoff volumes and pollutant loads were estimated for the larger sewersheds (Table 2-5). We used the US EPA's Simple Method for these calculations (EPA 1997). In the Simple Method, annual pollutant loads are estimated as the product of storm runoff volume and event mean pollutant concentrations, summed over the course of a year. Event mean concentrations were initially taken as the mean of the National Urban Runoff Program (NURP) data for residential and commercial land use, and modified slightly to account for differences in sewershed land uses in La Porte. NURP data were collected in the early 1980s in over 28 different metropolitan areas across the US.

Table 2-5

SELECTED STORM SEWERSHEDS AND ESTIMATED POLLUTANT LOADS

Landmark	Receiving Water	ID†	Area	P Load	Solids Load
Clear Lake Alum Doser	Clear Lake	1	93.6 ac (37.9 ha)	45 lb/y (20 kg/y)	32,762 lb/y (15 t/y)
Pine Lake Shopping Center	Lily Lake	10	35.5 ac (14.4 ha)	30 lb/y (14 kg/y)	14,217 lb/y (6 t/y)
Wardner Ave	Harris	29	10.1 ac (4.1 ha)	11 lb/y (4.8 kg/y)	4,051 lb/y (1.8 t/y)
Weller Ave	Lily Lake	19	14.4 ac (5.8 ha)	15 lb/y (6.8 kg/y)	5,752 lb/y (2.6 t/y)
Fremont St	Fremont Wetland	24	13.6 ac (5.5 ha)	9 lb/y (4.1 kg/y)	3,494 lb/y (1.6 t/y)
Lakeshore/Greenleaf	Stone Lake	17	6.0 ac (2.4 ha)	5 lb/y (2.3 kg/y)	1,988 lb/y (0.9 t/y)
Woodbine	Central Wetland	27	19.7 ac (8.0 ha)	17 lb/y (7.6 kg/y)	6,477 lb/y (2.9 t/y)
Greenleaf	Central Wetland	28	5.6 ac (2.3 ha)	5 lb/y (2.2 kg/y)	1,838 lb/y (0.8 t/y)
Craven / Pennsylvania	Craven Pond	25	11.3 ac (4.6 ha)	9 lb/y (3.9 kg/y)	3,306 lb/y (1.5 t/y)
Kosciusko St	Clear Lake	3	2.6 ac (1.1 ha)	2 lb/y (0.9 kg/y)	751 lb/y (0.3 t/y)

†Baetis_ID, as in Exhibit 4 and Figure 11

Again, note the large loads of solids and phosphorus entering Clear Lake and Lily Lake each year. These pollutants are having a particularly significant effect on Lily Lake as they enter the lake directly from the storm drain. The Clear Lake alum doser and sedimentation basin retains the above loads, greatly benefiting water quality in that lake.

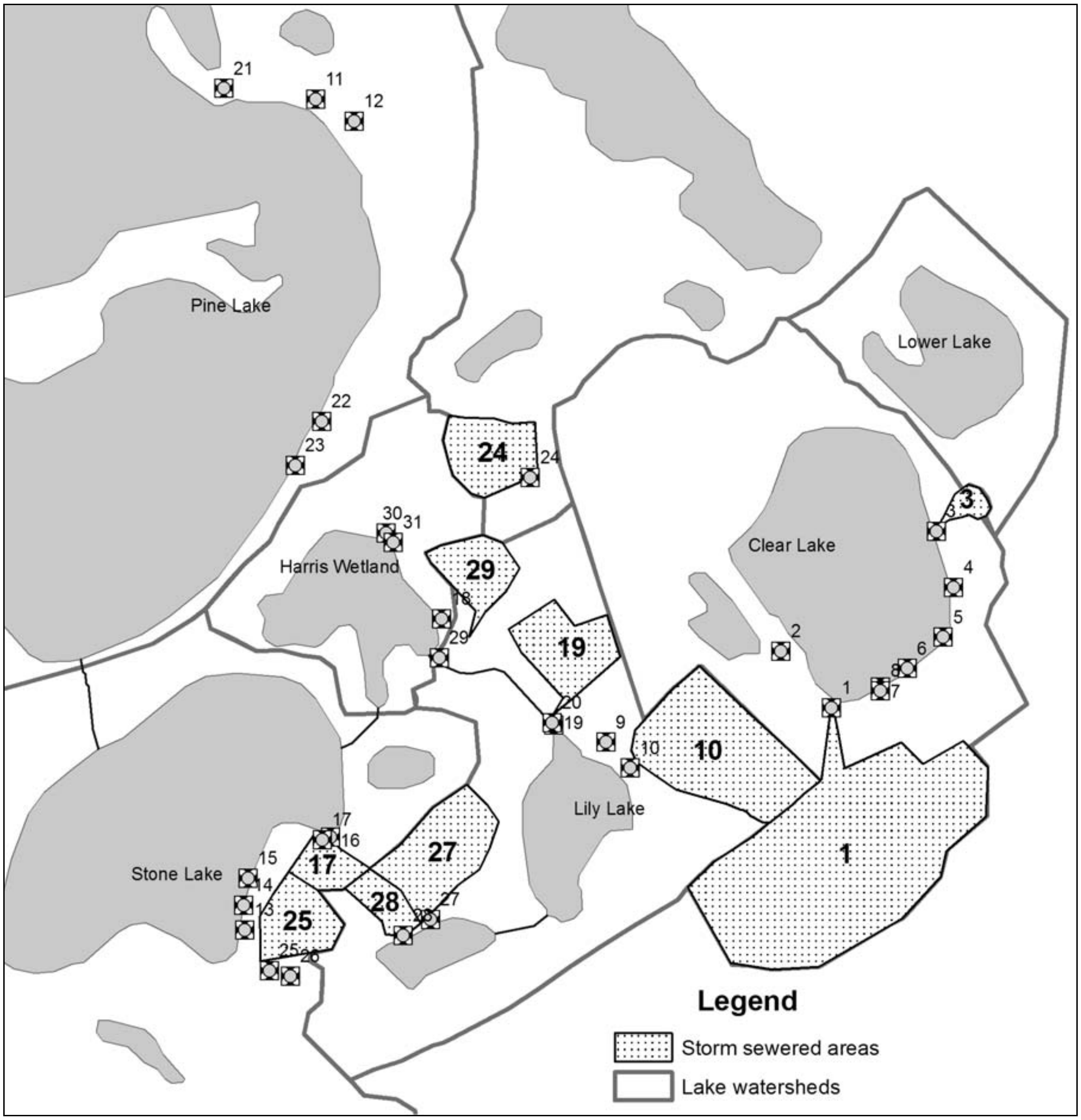

Figure 11. Selected Storm Sewersheds in the Study Area

2.7 Other Pollution Sources

The above sections provide data on the nature and sources of nonpoint source pollution to La Porte's lakes. Ditches and drains collect storm runoff and convey it to wetlands, detention ponds and the lakes. Various land uses differ in their pollutant runoff characteristics, and different soils have differing erosion potentials.

Other potential pollution sources include wastewater discharges, hazardous waste storage and management facilities, and underground storage tanks. There are no permitted landfills, Superfund sites, or NPDES wastewater discharges in the area draining to the study area lakes. The IDEM dataset did not contain a record for the former City landfill north of Clear Lake.

IDEM and US EPA provide the public with online access to underground storage tank UST) information (http://igs.indiana.edu/arcims/statewide/download.html). Table 2-6 and Figure 12 contain data from this database on underground storage tanks in the study area watershed.

Table 2-6

UNDERGROUND STORAGE TANKS IN THE WATERSHED

Facility	Address	RCRA ID	UST ID	Spills
Liquid Carbonic	3076 N State 39	IND982630378	UST009440	
Dietrich Industries Inc	120 Hoelocker Dr	IND139440341	UST011784	
Penske Truck Leasing	104 Hawthorne St	IND984929216	UST005998	Spill9106034

Underground storage tanks generally present low risk to surface water bodies. Leakages however do occur, and IDEM has records of leaking USTs in a separate database. Table 2-7 and Figure 12 contain data from IDEM's leaking UST (LUST) database, and some of the UST listed in Table 2-6 are also on the LUST list. The LUST database does not contain a field indicating cleanup status, but most have likely been remediated.

Table 2-7

LEAKING UNDERGROUND STORAGE TANKS IN THE WATERSHED

Program ID	Owner	Address
19678	La Porte County Highway Dept	1805 West 5th Street
11858	Family Express 24	1209 Pine Lake
22999	Summit Farm	4903 Johnson Rd
22764	La Porte County Government	809 State St
20322	Paul Szotec/All Furniture Mart	1350 Pine Lake Ave
18854	Pine Lake Marina	816 Pine Lake Ave
18357	Kenneth M & Norma F Clendenen	26 Pine Lake Ave
12401	Kingsley Furniture	102 Park St
11784	Dietrich Industries Inc	120 Hoelocker Dr
9787	Pine Lake Service Center	1213 Pine Lake Ave
2889	Clark Oil & Refining #1985	911 Pine Lake Ave
17969	Penske Truck Leasing	104 Hawthorne St
6768	United #6091	322 Lincolnway

IDEM also has a database of known facilities that generate and/or manage hazardous waste, non-hazardous industrial waste, and solid waste. Table 2-8 and Figure 13 provide these data for the study area watershed. The majority of the points collected are Large Quantity Generators (LQGs). Treatment Storage and Disposal facilities (TSDs) are also being collected. Occasionally, a Small Quantity Generator (SQG) or Conditionally Exempt Small Quantity Generator (CESQG) GPS points may be collected if the location has significant environmental issues.

Table 2-8

INDUSTRIAL WASTE SITES IN THE WATERSHED

Program ID	Name	Address	Type
IND005107354		1105 Washington St	
IND078918976	La Porte Hospital Inc	State & Madison St	CEG
IND139440341	Dietrich Industries Inc	120 Hoelocker Dr	CEG
IND173408170		402 Truesdell Ave	
IND984898239		150 Pine Lake Ave	
INR000006270	NIPSCO La Porte MGP Site	Se Corner-Linwood & Clear Lake	CEG
INR000100297	Unknown (Dietrich ?)		

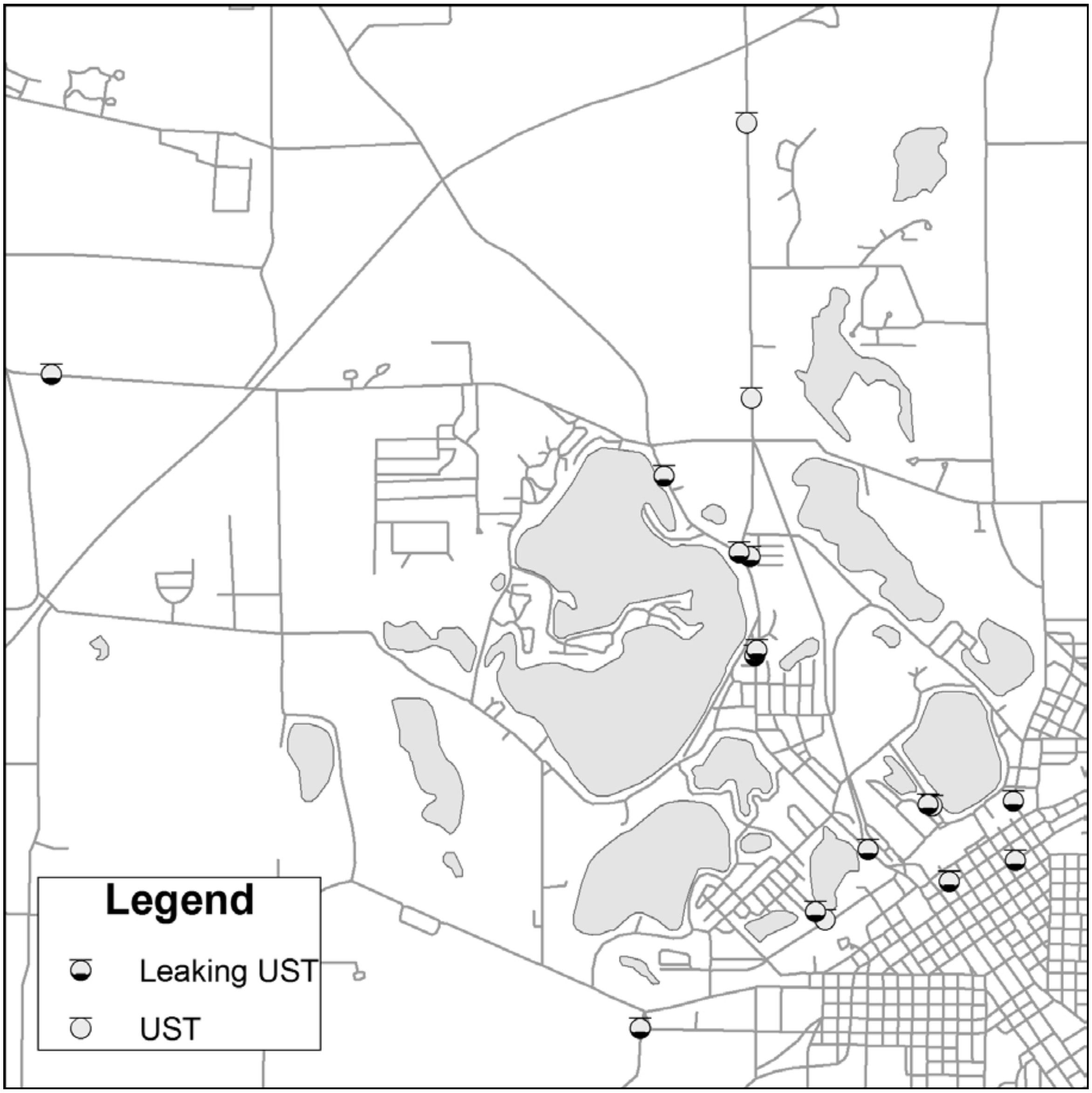

Figure 12. UST and LUST in the Watershed

Closure plans are currently being prepared for the former City landfill north of Clear Lake. This site will be closed soon, possibly in conjunction with NewPorte Landing Redevelopment.

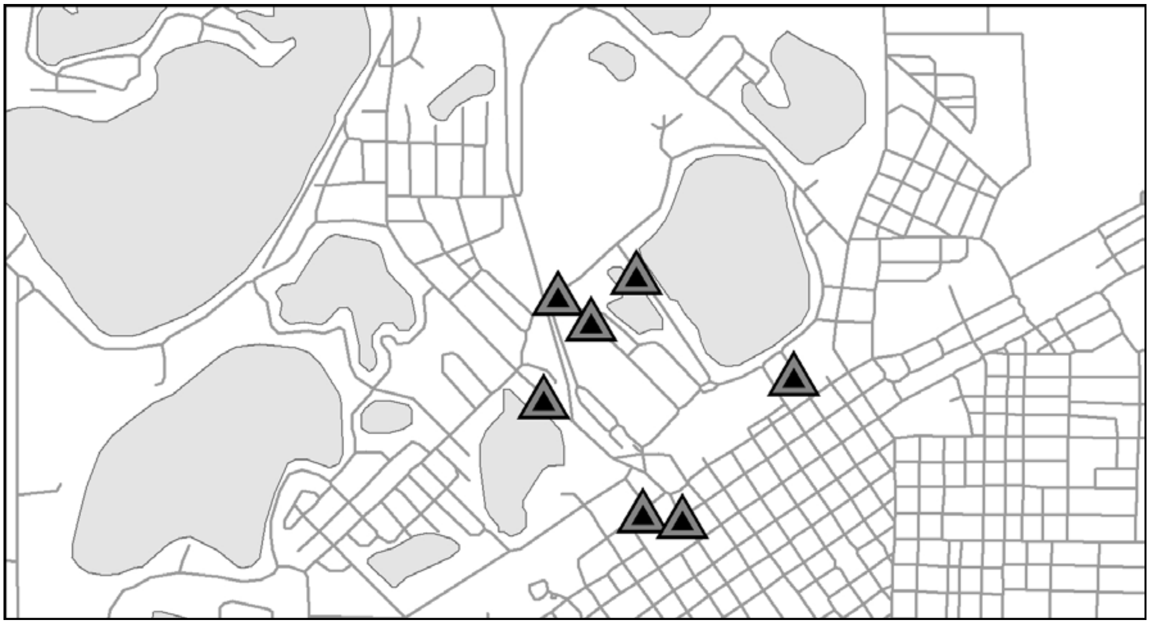

Figure 13. Locations of Industrial Waste Facilities

2.8 Local Ordinances

The City of La Porte municipal code contains some provisions for protection of its lakes and related resources. Secs. 82-561 through 82-626, Article VI, entitled “Protection of Wetlands and Lakes” contains regulations for protection for La Porte’s wetlands and lakes by regulating development activities in wetlands and those adjacent upland sites that may adversely affect wetlands and lakes. The code requires the City Zoning Administrator to review any application for a building permit in the context of the City’s current wetlands map and/or a field observation to determine whether or not the requested permit would result in a regulated activity within a wetland district, or which may affect a wetland district in any way. There are “General Development Standards” in the wetlands protection ordinance, written to guide development outside a wetland district to prevent harm to wetlands and lakes inside the wetland district. Those standards include the following:

(1) No building, structure, street, alley, driveway or parking area shall be placed within a wetland district.

(2) Any building constructed within 50 horizontal feet of a wetland district shall have its lowest floor level at least two feet above the ordinary high water mark.

(3) No surface water runoff from a development, including any commercial development, real estate subdivision, or construction or any building or other structure, shall be directed or permitted to flow into a wetland district, except as permitted by subsection 82-608(4), provided, however, that nothing in this article shall prohibit the construction of a single-family dwelling, even though the surface water runoff from such dwelling may flow into a wetland district.

(4) No soil storage pile shall be placed within 200 feet of a wetland district unless a permit to do so is obtained in the manner provided for in division 3 of this article. Sediment from all soil storage piles placed within 200 feet of the boundary of a wetland district shall be controlled by placing straw bales, filter fence or other appropriate containment barriers around the piles. Soil loss from any construction site within 200 feet of a wetland district shall be controlled by appropriate practices to limit erosion as recommended by the United States Department of Agriculture.

2.9 Lake and Watershed Management Institutions

Several public agencies and non-governmental institutions have an interest in lake quality or watershed management. This section identifies those institutions and describes their missions.

2.9.1 City of La Porte

The City is a major property owner and/or manager of shoreline and watershed lands and is the principal stakeholder for stewarding lake quality in La Porte. The City has the obligation to provide leadership, vision, and as appropriate, assistance managing the lakes. The Mayor and City Council have the responsibility of establishing visions, writing environmental ordinances, and seeing to their enforcement. City Hall can play an important role in environmental education as well, by distributing outreach materials and working with the schools, parks, and non-governmental groups (lake associations, scout troops, etc).

The Park and Recreation Department, as a riparian landowner and manager, has taken the lead for many lake and watershed activities in recent years. Their property and facilities management directly affects lake water quality and wetland habitats. For the past ten years, the Park Department has operated the aquatic weed harvester on Clear Lake. The Park Department can also assist in environmental education and outreach by distributing materials and support natural resource education programs on its properties.

The Wastewater Department is the lead for managing stormwater in the City of La Porte and for seeing to compliance with the Phase 2 NPDES stormwater regulations. They operate and maintain the stormwater alum treatment system at Clear Lake. The Wastewater Department has an ongoing program to identify and correct illicit connections to the stormwater system, to identify and map all stormwater outfalls, and to implement BMPs. The Wastewater Department's ability to affect lake water quality in La Porte cannot be overestimated.

2.9.2 NewPorte Landing Community Development Partnership, LLC

Several private institutions in La Porte have joined with the La Porte Economic Advancement Foundation to form the La Porte Community Development Partnership, LLC. This partnership's purpose is to support the creation of NewPorte Landing, a brownfield redevelopment project in La Porte. Much of the area proposed for this redevelopment abuts or drains to Clear Lake. NewPorte Landing is planned as a mixed use project, with commercial, residential and recreational components. We recommend that as planning for this project progresses, the watershed management recommendations in Chapter 6 and the principals of sustainable development become an integral part of the project.

2.9.3 La Porte County Health Department

The La Porte County Health Department Environmental Health Division samples water at public beaches in the county, including a number of sites in the study lakes. Sampling and testing is to monitor *Escherichia coli* bacteria concentrations for swimmer safety. Testing of the beaches normally is conducted twice weekly. Their data have been utilized in this diagnostic study and are evaluated in the following chapter.

2.9.4 State of Indiana Agencies

The Department of Natural Resources and the Indiana Department of Environmental Management (IDEM) are the lead agencies for managing environmental resources at the state level. The DNR Division of Fish and Wildlife manages the fisheries of the lakes in La Porte, and it's Lake and River Enhancement Program provides technical and financial support specific to lake and watershed management. IDEM regulates the discharge of pollutants to state waters, and administers federal environmental grants in Indiana under the Clean Water Act.

The Northwestern Indiana Regional Planning Commission (NIRPC) is a multi-purpose sub-state area-wide planning agency. NIRPC's planning area is comprised of the counties of Lake, Porter and La Porte and covers 1,520 square miles. Planning responsibilities are in the areas of transportation, public transit, environmental and community development. In 2005 NIRPC published a Watershed Management Plan for Lake, Porter, and La Porte Counties.

The La Porte County Soil and Water Conservation District's (SWCD) mission is to enhance the environment by preserving the soil, water and related resources of La Porte County. The SWCD provides information about soil, water, and related natural resource conservation to interested citizens. They also identify and prioritize local soil and water resource concerns, and connect land users to sources of educational, technical and financial assistance to implement conservation practices and technologies. The SWCD offers assistance reviewing stormwater pollution prevention and erosion control plans.

The Kankakee River Basin Commission was created in 1977 by the Indiana General Assembly to address water resource development issues, primarily flood control and drainage problems, in the eight-county Kankakee River basin. Currently, the Commission's priorities include sediment/erosion, development impacts on the basin, and flooding. The Commission is working with the local drainage boards and SWCDs to encourage and implement best management practices on farmland. With the local drainage boards, the Commission has continued a program to remove trees and obstructions in the river channel which have led to scouring of the riverbanks and levees and also partnered with other local and state agencies to provide stabilization to the riverbanks through vegetation or rip rap.

2.9.5 Non-Governmental Organizations

The La Porte Area Lake Association was formed in 1965 and is a volunteer organization, comprised of businesses and residents, both on the lakes and surrounding neighborhoods, who are concerned about the quality health of the lakes. The La Porte Area Lake Association monitors issues and problems with the lakes. They have an annual lake clean-up day, fund fish stocking and weed control. Their website can be reviewed at www.LaPorteLakes.com.

3.0 WATER QUALITY DATA ANALYSIS

Historic data on water quality in the six study lakes are somewhat limited. Available data were collected, analyzed, and are summarized in this chapter. Sources of existing data include the following:

- The STORET database, a repository for water quality, biological, and physical data and is used by state environmental agencies, EPA and other federal agencies, universities, private citizens, and many others.
- Indiana Departments of Environmental Management and Natural Resources.
- La Porte County Health Department public beach monitoring data, 1991 to 2005.

3.1 Methods

As part of this study, we collected a single water quality sample in each lake for analysis of a limited suite of parameters. A Quality Assurance Project Plan was prepared documenting methods and materials (Baetis 2006). We analyzed the samples for chlorophyll a, total suspended solids, total phosphorus, ortho-phosphate, ammonia nitrogen, total Kjeldahl nitrogen, nitrate+nitrite, and plankton (Figure 14). Field measurements included dissolved oxygen and temperature profiles, pH, conductivity, Secchi disk transparency, and light transmission. Plankton tows were also performed; plankton and aquatic macrophytes data are presented in Chapter 4. Purdue University North Central performed the field measurements and plankton counts. Severn Trent Laboratories of Valparaiso, Indiana performed the chemical analyses. Laboratory reports are reprinted as Appendix F. Pine, Stone, Lily, Clear and Harris Lakes had all laboratory and field parameters analyzed from samples collected on July 19, 2006. Lower Lake did not have standing water until September (after several significant precipitation events); on October 10, 2006, water samples were collected in Lower Lake for analysis by the laboratory. No field measurements were made, as depth was less than one foot (0.3 m).

Parameter	Method	Lily Lake	Qualifier	Clear Lake	Qualifier	Harris Lake	Qualifier	Stone Lake	Qualifier	Pine Lake	Qualifier	Lower Lake	Qualifier
Date of Sampling		7/25/2006		7/25/2006		7/25/2006		7/25/2006		7/25/2006		10/10/06	
Residue, Non-Filterable (mg/L)	EPA 160.2	11.0		3.7		68.0		7.7		6.1		50.8	
Chlorophyll-a (ug/L)	SM 10200H	0.57		0.50	K	0.90		0.77		0.50	K	0.50	K
Ammonia Nitrogen (mg/L)	EPA 350.1	1.56		0.026		0.017	J	0.185		0.388		0.126	B
Nitrogen, Total Kjeldahl (mg/L)	EPA 351.2	3.15		0.889		2.00		0.930		1.18		1.77	B
Nitrogen, Nitrate-Nitrite (mg/L)	EPA 353.2	0.047	J B	0.048	J B	0.022	J ^ B	0.020	J ^ B	0.017	K	0.0860	J
Total Phosphorus (mg/L)	EPA 365.1	0.070	J B	0.049	J B	0.143	B	0.064	J B	0.105	B	0.0166	K
Ortho-Phosphate (mg/L)	EPA 365.1	0.046	J B	0.033	J B	0.050	J B	0.044	J B	0.077	J B	0.0137	K

Notes:

J Result is less than the reporting limit but greater than or equal to the MDL and the concentration is an approximate value.
B Compound was found in the blank and in the sample
K Observation is less than the MDL
^ Instrument related QC exceeds the control limits.

Figure 14. Results of Laboratory Analyses

These and other water quality data are discussed below.

3.2 Dissolved Oxygen and Temperature

Lake water temperatures rise and fall both seasonally and diurnally. The seasonal changes are quite important in nutrient and oxygen cycling. As air temperatures rise in late spring, heat from the sun begins to warm the lake. As the amount of solar radiation absorbed decreases with depth, the lake heats from the surface down. The warm water on the surface is less dense than the colder water below resulting in a layer of warm water that floats over the cold water. This phenomenon is termed thermal stratification, and is more pronounced in deep lakes than in shallow lakes. The warm water at the surface is called the epilimnion. The cold layer below the epilimnion is called the hypolimnion. These two layers are separated by a layer of water which rapidly changes temperature with depth. This is called the thermocline (or metalimnion). The three distinct layers of water, each with a different temperature or range of temperatures, are an example of thermal stratification.

The temperature of the water column of Stone, Pine, Lily, Harris and Clear Lakes was measured on July 19, 2006. Stone and Pine Lakes are sufficiently deep to develop strong stable thermoclines, being up to 36 and 71 feet deep respectively (11 m and 21.6 m). Clear Lake, Lily Lake and Harris Lake are much shallower, only 12, 30 and about 4 feet respectively, and although they may stratify thermally, a strong summer storm can mix the entire lake and destratify them.

Thermal stratification creates layers of water on the surface and bottom that do not mix during the stratification period. The chemistries of the epilimnion may be quite different than the hypolimnetic waters that are isolated from the influences of sunlight and atmospheric reaeration. It is common, particularly in eutrophic lakes, for dissolved oxygen (DO) concentrations to change with lake depth. Oxygen production occurs in the epilimnion or top portion of a lake, where sunlight drives photosynthesis. The surface waters are also oxygenated by atmospheric reaeration. Oxygen is consumed near the bottom of a lake, where sunken organic matter accumulates and decomposes. If the lake is shallow and easily mixed by winds, the DO concentration may be fairly consistent throughout the water column as long as it is windy. Without winds to mix the lake, even shallow, unstratified lakes may develop pronounced decline of DO with depth.

Dissolved oxygen concentrations were measured simultaneously with temperature in each lake. Figure 15 plots the profiles for four lakes; field data can be reviewed in Appendix E. Notice in Figure 15 that surface waters are generally well oxygenated, but all lakes show decreased DO with depth. Stone and Pine Lakes have no DO below 26 ft (8m). Lily and Clear Lakes, much shallower, have little or no DO below 10 ft (3m). Harris Lake is only about one meter deep (3.3 ft), and at 0.5 m depth, DO was found to be less than 1 mg/L. Under such low DO concentrations, fish will survive only in the surface waters, where DO is around 5 mg/L or higher.

3.3 Conductivity

Conductivity is a measure of water's ability to conduct electrical current and reflects the concentration of dissolved salts. Higher concentrations of dissolved salts have higher levels of conductivity. Conductivity profiles were also measured in each lake (Table 3-1). Harris Lake had the lowest conductivity among the five lakes where conductivity profiles were measured. Clear Lake had the highest. Differences in conductivities are related to local geological variations and external (stormwater) loads. Note the increased conductivity with depth. This increase with depth is typical for lakes.

Indiana's water quality standard for conductivity is 1,200 μS (at 25 degrees Celsius), equivalent to a dissolved solids concentration of 750 mg/L. None of the lakes exceeded this standard.

Notice the high conductivity of Lily Lake in comparison to Stone and Pine Lakes. Lily Lake is part of the same chain of waterbodies. The high conductivity there is likely the result of nonpoint source pollution from stormwater loads from the commercial and transportation properties draining to Lily Lake.

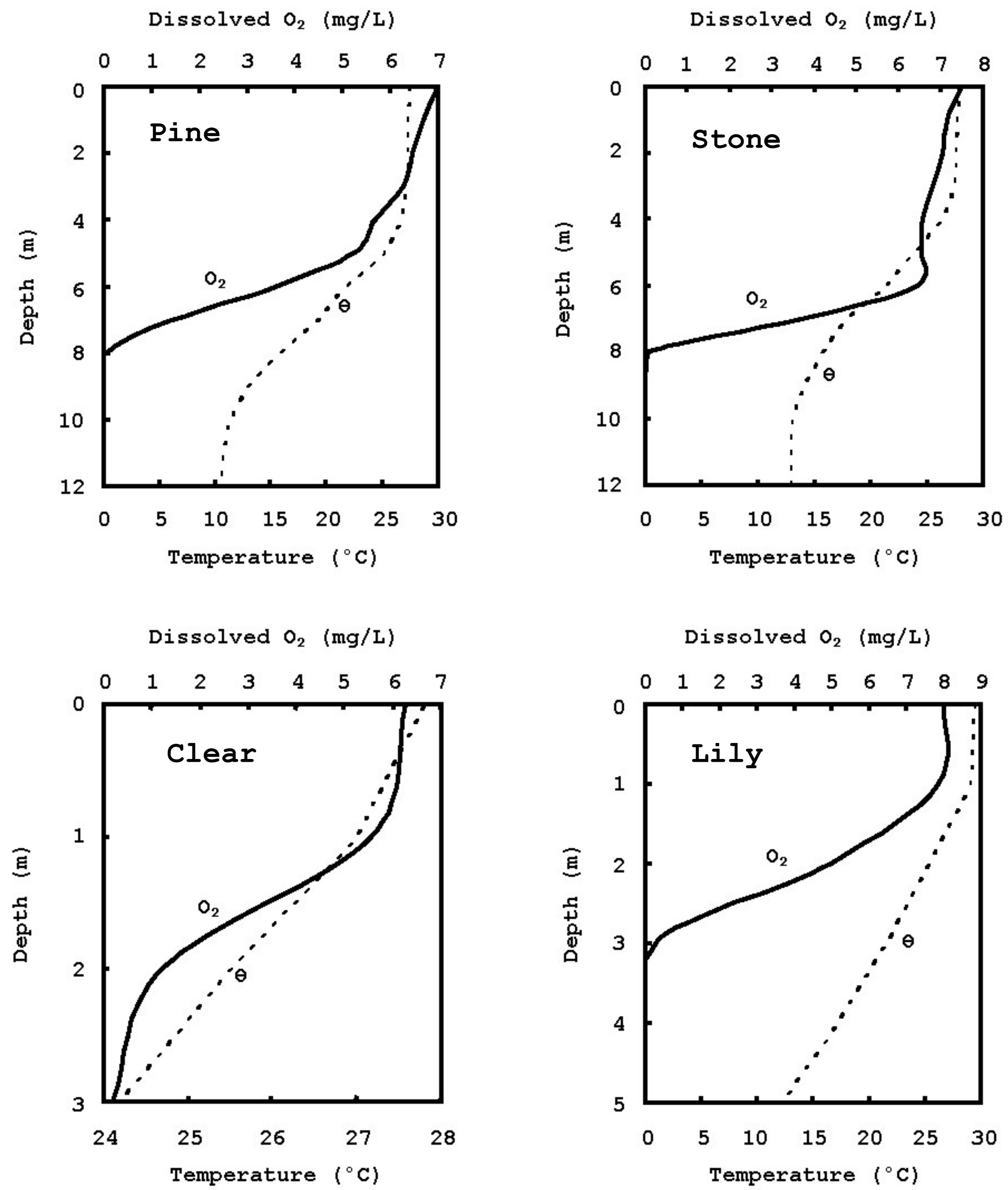

Figure 15. DO and Temperature Profiles in Stone, Lily, Pine, and Clear Lakes on July 19, 2006.

Table 3-1

CONDUCTIVITY (µS) PROFILES ON JULY 19, 2006

Depth (m)	Clear Lake	Lily Lake	Stone Lake	Harris	Pine Lake
1	803.0	686.0	250.0	239.1	303.8
2	926.0	728.0	250.0	287.9	304.0
3	981.0	830.0	250.9		304.2
4		822.0	258.0		307.2
5		865.0	266.6		312.3
6			272.0		313.3
7			277.3		313.3
8			282.8		313.7
9			290.4		325.0
10			296.6		332.7
11			325.3		337.0
12			353.3		338.3

3.4 Suspended Solids

We were unable to find historic data on total suspended solids concentrations (TSS) in the study lakes. Water samples were analyzed for suspended solids (Table 3-2). All samples were collected on Tuesdays, and motor boat traffic is not expected to have had significant influence on the concentrations.

Table 3-2

TOTAL SUSPENDED SOLIDS CONCENTRATIONS

Lake	Date of Sampling	Suspended Solids (mg/L)
Clear	25-Jul-2006	3.7
Lily	25-Jul-2006	11
Lower	10-Oct-2006	50.8
Harris	25-Jul-2006	68
Stone	25-Jul-2006	7.7
Pine	25-Jul-2006	6.1

In Harris and Lower lakes, the high suspended solids concentrations are from resuspension of bottom deposits during sampling. Due to the lakes' shallowness it was difficult to obtain a sample without also disturbing and resuspending bottom sediments. No carp or other fish were observed in Harris or Lower Lakes, probably because of the shallowness of these habitats which would not likely allow for over-wintering of fish populations. Carp are present in large numbers in Lily Lake, and given their bottom-disturbing feeding habits, probably contribute to the relatively high TSS level measured there.

In the other three lakes, TSS is largely indicative of plankton and suspended detritus in the water column.

3.5 Transparency

Transparency can be affected by the color of the water, algae, and suspended sediments. Transparency decreases as color, suspended sediments, or algal abundance increases. The Secchi disk is a long-used instrument for measurement of lake transparency. The 8-inch (20 cm) black and white disk is lowered into the water until it can be no longer seen by the observer. This depth of disappearance, called the Secchi depth, is a measure of the transparency of the water.

Secchi disk transparency is a metric in the Indiana Trophic State Index (ITSI); five points are added to the score if the Secchi disk transparency is less than five feet. Another perspective for this measure is the US EPA's National Eutrophication Survey (NES), which published univariate trophic state criteria using Secchi disk depth (US EPA 1974). The NES delineated lakes with a Secchi disk depth less than 2m (6.6ft) as eutrophic, or highly productive. Lakes with a Secchi disk depth greater than 3.7m (12.1 ft) are considered oligotrophic lakes (having low levels of organic productivity). And, lakes with moderate productivity, termed mesotrophic lakes, have Secchi disk depths between 2 and 3.7 meters.

Lake transparency was measured in each lake during July 2006 using the Secchi disk. Those data, as well as historic data available from other sources, are provided below (Tables 3-3 through 3-6). All measurements were greater than five feet, so no points for this metric were added to the ITSI. Clear Lake Secchi disk depths, given in Table 3-3, are available for several years. No trend in Secchi disk depth is apparent for Clear Lake, suggesting fairly unchanged transparency in that lake.

Table 3-3

HISTORIC AND CURRENT SECCHI DISK DEPTHS IN CLEAR LAKE
(Sources: IDEM, Harza, this study)

Date	Secchi Disk Depth
1-Sep-89	7.0 ft (2.1m)
19-Jul-95	6.6 ft (2.0m)
13-Jul-99	6.6 ft (2.0m)
20-Jul-05	7.0 ft (2.1 m)
19-Jul-06	6.6 ft (2.0m)

Table 3-4 reprints Secchi disk data for Pine Lake collected between 1976 and 2006. The mean of the eight measurements is 13.7 ft (4.2m). By NES standards, these data would suggest that Pine Lake is oligotrophic. The data are plotted in Figure 16. While an increase in Secchi depth over time may be present, it is not statistically significant (p-value = 0.076). Recall that zebra mussels (*Dreissena polymorpha*) invaded Pine Lake on or before 1997, so the apparent high Secchi disk depths of 1999 and later are likely, at least in part, attributable to the proliferation of this invasive filter feeder.

Table 3-4

HISTORIC AND CURRENT SECCHI DISK DEPTHS IN PINE LAKE
(Sources: STORET, IDEM, DNR 2000, this study)

Date	Secchi Disk Depth
22-Jun-76	10.0 ft (3.0m)
Jul-76	13.0 ft (4.0m)
Jul-83	11.0 ft (3.4m)
Jul-89	14.5 ft (4.4m)
21-Aug-89	9.5 ft (2.9m)
13-Jul-99	19.0 ft (5.8m)
Jun-00	18.0 ft (5.5m)
19-Jul-06	14.8 ft (4.5m)

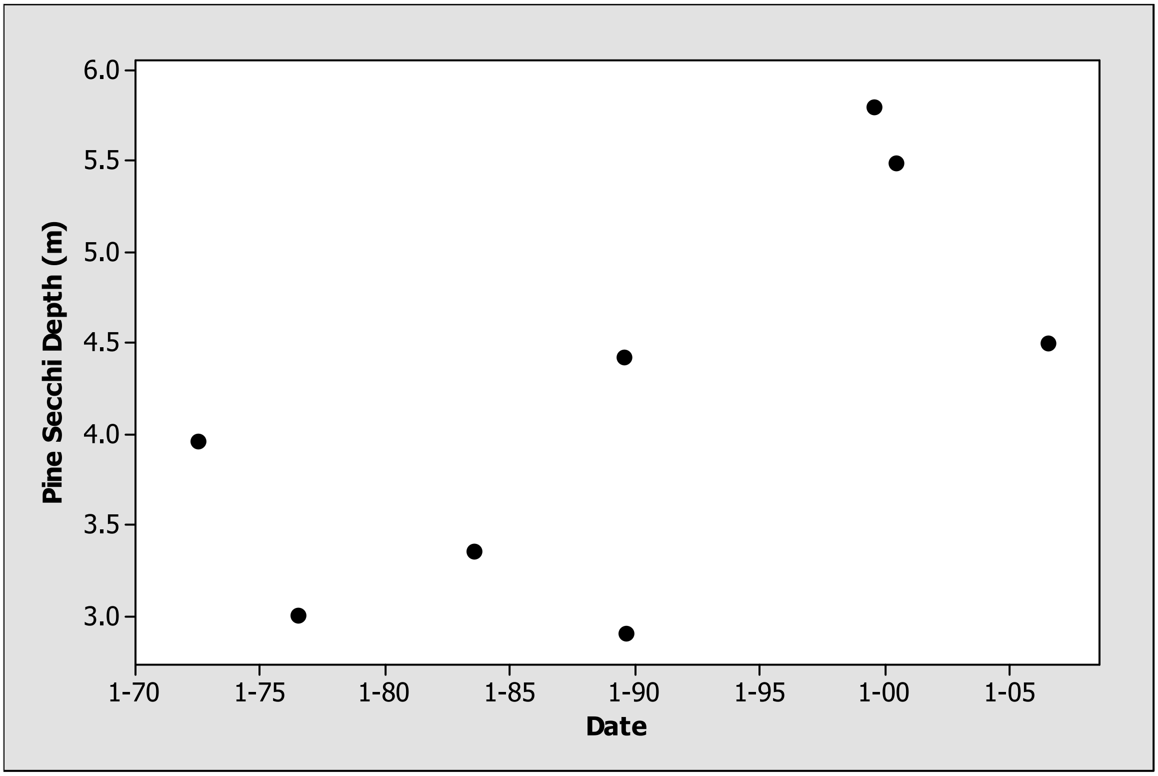

Figure 16. Secchi Disk Visibility in Pine Lake, 1976 to 2006.

Table 3-5 reprints Secchi disk data for Stone Lake collected between 1975 and 2006. The mean of the four measurements is 13.3 ft (4.0m) and the median is 12.3 ft (3.8m).

Table 3-5

HISTORIC AND CURRENT SECCHI DISK DEPTHS IN STONE LAKE

(Sources: STORET, IDEM, this study)

Date	Secchi Disk Depth
7-Aug-75	13.5 ft (4.1m)
16-Aug-89	13.8 ft (4.2m)
18-Jul-95	11.5 ft (3.5m)
13-Jul-99	22.0 ft (6.7m)
19-Jul-06	14.8 ft (4.5m)

Figure 17 is a scatterplot of the Stone Lake Secchi disk depth, including a regression line. The regression has a positive slope, providing strong evidence for improving water transparency in Stone Lake over the past three decades ($p = 0.001$). Some of this increase is likely due to the aforementioned zebra mussel invasion of Stone and Pine Lakes prior to 1997, although confounding factors include diminished precipitation and runoff since the mid-1990s and competition for nutrients by macrophytes.

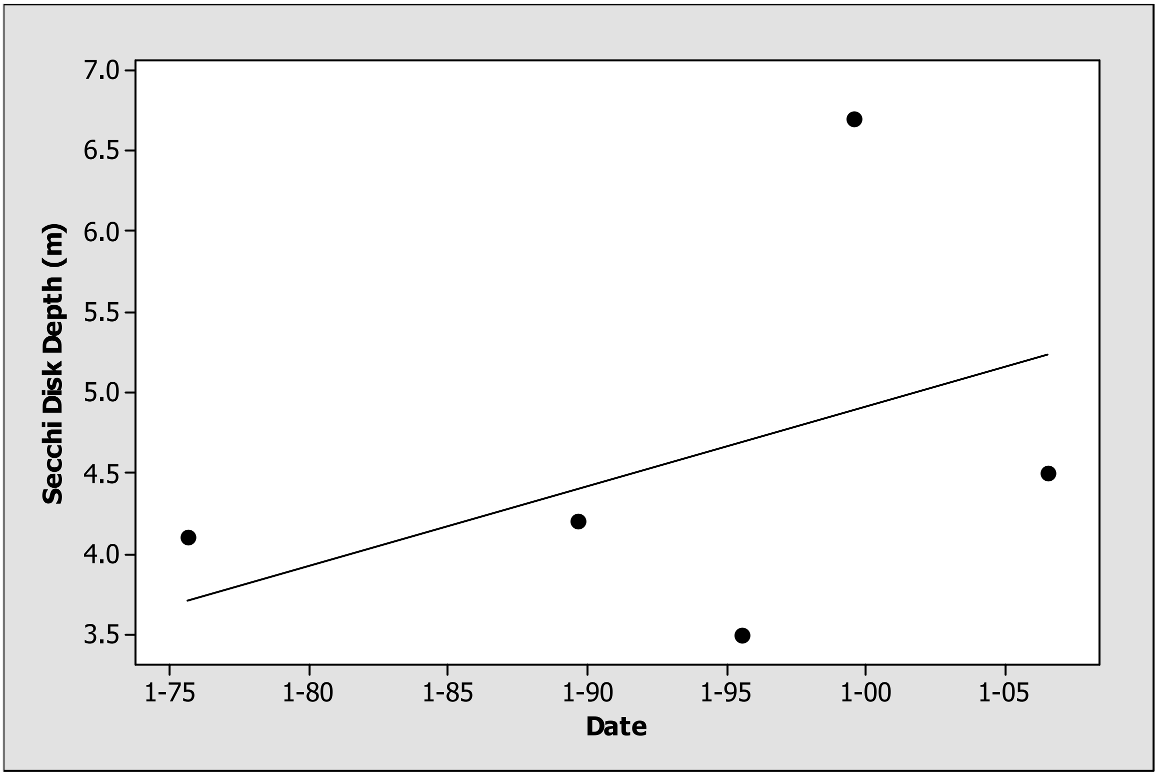

Figure 17. Secchi Disk Visibility in Stone Lake, 1975 to 2006.

Secchi disk measurements were also made in Lily and Harris Lakes (Table 3-6), but not in Lower. Lower Lake is seasonally flooded, and during our study, contained, at most, less than one foot of water, and field water quality measurements were not made. Harris and Lily Lakes are the least transparent of the lakes being studied.

Table 3-6

SECCHI DISK MEASUREMENTS IN LILY AND HARRIS LAKES

Date	Lake	Secchi Disk Depth
19-Jul-06	Lily	2.6 ft (0.8m)
19-Jul-06	Harris	2.0 ft (0.6m)

3.6 Light Transmission

As sunlight passes through a lake, it is absorbed by plankton and other suspended materials, backscattered, and turned into heat. As light transmission decreases with depth, there is less energy for phytoplankton to utilize. At the depth that 99% of incident radiation is absorbed, plankton can no longer survive off sunlight alone (Wetzel 2001). Light transmission at a depth of three feet is one metric in the Indiana Trophic State Index. This was measured during our field studies (Table 3-7). The greatest depths of 1% light transmission are in Pine and Stone Lakes. As mentioned earlier, the zebra mussel populations in these lakes are, at least in part, responsible for the depths of light transmission in those waterbodies.

Table 3-7

LIGHT TRANSMISSION

Lake	Date	Incident Radiation	Radiation at 3-ft	%	Depth of 1% Transmission
Clear	19-Jul-06	0.60	0.06	10	2.8 ft (0.86m)
Pine	19-Jul-06	0.14	0.04	29	10.5 ft (3.2m)
Stone	19-Jul-06	0.25	0.07	28	12.14 ft (3.7m)
Harris	19-Jul-06	0.18	0	0	0.9 ft (0.28m)
Lily	19-Jul-06	0.74	0.02	3	1.6 ft (0.5m)

It is logical that light transmission observations would correlate well with Secchi disk transparency data, and indeed this is the case (Table 3-8, extracted from Exhibit 9). Both variables are dependent on the light absorbency characteristics of water and suspended materials.

Table 3-8

CORRELATION OF SECCHI DISK AND LIGHT TRANSMISSION VARIABLES*

	Secchi Disk Depth	% Radiation at 3-ft
% Radiation at 3-ft	0.991 (0.001)	
Depth of 1% Transmission	0.989 (0.001)	0.983 (0.003)

* Pearson Correlation Coefficients and associated P-values

3.7 Phosphorus

Phosphorus is a nutrient which all organisms require. It is a natural element found in rocks, soils and organic material. Phosphorus clings tightly to soil particles and its concentrations in clean waters are generally very low. However, phosphorus is used extensively in fertilizers, detergents, and other chemicals, so it can be found in higher concentrations in areas of human activity. In most freshwaters, phosphorus is often found to be the nutrient that limits algae and aquatic macrophyte growth, because it is present in the least amount relative to the needs of plants.

If excessive amounts of phosphorus and nitrogen are added to the lake, algae and aquatic plants can be produced in large quantities. "Eutrophic" lakes are characterized by high nutrient concentrations, resulting in high productivity of plant growth. Such lakes are often shallow, with algal blooms and periods of oxygen deficiency in deeper waters. "Oligotrophic" waters are characterized by extremely low nutrient concentrations, moderate plant productivity and clear, well oxygenated waters. Limnologists may categorize trophic status according to phosphorus concentration. The Indiana Trophic State Index (ITSI) includes a metric for total phosphorus and another for dissolved phosphorus; up to five points may be added to the ITSI score for each of these metrics. Another classification system was assembled from the NES (EPA 1974). Under this system, lakes with total phosphorus concentrations below 0.010 mg/L are classified as oligotrophic, phosphorus concentrations between 0.010 and 0.020 mg/L are indicative of mesotrophic or moderately productive lakes, and eutrophic lakes have phosphorus concentrations exceeding 0.020 mg/L (EPA 1974). For comparison, Lake Michigan is classified as oligotrophic and total P concentrations in open water there are generally around 0.005 mg/L.

Total and dissolved reactive phosphorus were measured from composite samples collected in each lake (Table 3-1). Historic data from IDEM's files are reprinted in Exhibits 5 through 7. A few additional data points were retrieved from the EPA's STORET dataset.

Table 3-9 compiles all phosphorus measurements that we have been able to locate for Clear Lake. Total P measurements over the past 31 years range from about 0.007 mg/L to 0.07 mg/L. The mean of the six total P measurements is 0.04 mg/L and the median is 0.04 mg/L, classifying Clear Lake as eutrophic under the NES classification paradigm.

Table 3-9

PHOSPHORUS DATA AVAILABLE FOR CLEAR LAKE

(Sources: STORET, IDEM, Harza, this study)

Lake	Date	Sample Type	Parameter	Result
Clear	6-Aug-75	unknown	Total PO_4	0.02 mg/L
Clear	1-Sep-89	Composite	Total P	0.07 mg/L
Clear	1-Sep-89	Composite	Soluble P	0.05 mg/L
Clear	18-Jul-95	Epilimnion	Total P	0.036 mg/L
Clear	18-Jul-95	Epilimnion	Ortho-P	0.008 mg/L
Clear	18-Jul-95	Hypolimnion	Total P	0.035 mg/L
Clear	18-Jul-95	Hypolimnion	Ortho-P	0.005 mg/L
Clear	13-Jul-99	Epilimnion	Total P	0.045 mg/L
Clear	13-Jul-99	Epilimnion	Ortho-P	0.014 mg/L
Clear	25-Jul-06	Composite	Total P	0.049 mg/L
Clear	25-Jul-06	Composite	Ortho-PO_4	0.033 mg/L

Table 3-10 compiles all phosphorus measurements that we have been able to locate for Pine Lake. Total P measurements over the past 17 years range from about 0.01 mg/L to as high as 0.153 mg/L (a hypolimnetic sample collected in 1989). Most measurements of total phosphorus are greater than 0.02 mg/L, also classifying Pine Lake as eutrophic under the NES classification system.

Table 3-10

PHOSPHORUS DATA AVAILABLE FOR PINE LAKE

(Sources: IDEM, this study)

Lake	Date	Sample Type	Parameter	Result
Pine	21-Aug-89	Epilimnion	Total P	0.034 mg/L
Pine	21-Aug-89	Epilimnion	Ortho-P	0.002 mg/L
Pine	21-Aug-89	Hypolimnion	Total P	0.153 mg/L
Pine	21-Aug-89	Hypolimnion	Ortho-P	0.107 mg/L
Pine	13-Jul-99	Epilimnion	Total P	0.01 mg/L
Pine	13-Jul-99	Epilimnion	Ortho-P	0.009 mg/L
Pine	13-Jul-99	Hypolimnion	Total P	0.01 mg/L
Pine	13-Jul-99	Hypolimnion	Ortho-P	0.094 mg/L
Pine	25-Jul-06	Composite	Total P	0.105 mg/L
Pine	25-Jul-06	Composite	Ortho-PO_4	0.077 mg/L

Table 3-11 compiles all phosphorus measurements that we have been able to locate for Stone Lake. Total P measurements over the past 31 years range from about 0.007 mg/L to 0.10 mg/L. The mean of the eight total P measurements is 0.051 mg/L and the median is 0.048 mg/L, also classifying Stone Lake as eutrophic under the NES classification system.

Table 3-11

PHOSPHORUS DATA AVAILABLE FOR STONE LAKE

(Sources: STORET, IDEM, this study)

Lake	Date	Sample Type	Parameter	Result
Stone	7-Aug-75	unknown	Ortho-PO_4	0.01 mg/L
Stone	7-Aug-75	unknown	Total PO_4	0.02 mg/L
Stone	16-Aug-89	Epilimnion	Total P	0.101 mg/L
Stone	16-Aug-89	Hypolimnion	Total P	0.048 mg/L
Stone	16-Aug-89	Hypolimnion	Ortho-P	0.002 mg/L
Stone	18-Jul-95	Epilimnion	Total P	0.021 mg/L
Stone	18-Jul-95	Epilimnion	Ortho-P	0.005 mg/L
Stone	18-Jul-95	Hypolimnion	Total P	0.078 mg/L
Stone	18-Jul-95	Hypolimnion	Ortho-P	0.008 mg/L
Stone	13-Jul-99	Epilimnion	Total P	0.041 mg/L
Stone	13-Jul-99	Epilimnion	Ortho-P	0.01 mg/L
Stone	13-Jul-99	Hypolimnion	Total P	0.048 mg/L
Stone	13-Jul-99	Hypolimnion	Ortho-P	0.008 mg/L
Stone	25-Jul-06	Composite	Total P	0. 064 mg/L
Stone	25-Jul-06	Composite	Ortho-PO_4	0.044 mg/L

Fewer measurements of phosphorus have been made in Lily Lake, and up until this study, none had been made in Lower or Harris Lakes (Table 3-12). These measurements also indicate the trophic state of these three lakes is eutrophic (NES system) as well.

Table 3-12

PHOSPHORUS DATA AVAILABLE FOR LOWER, LILY AND HARRIS LAKES

(Sources: STORET, this study)

Lake	Date	Sample Type	Parameter	Result
Lily	22-Jul-76	Unknown	Total Sol. PO_4	0.1 mg/L
Lily	22-Jul-76	Unknown	Total PO_4	0.11 mg/L
Lily	25-Jul-06	Composite	Total P	0.070 mg/L
Lily	25-Jul-06	Composite	Ortho-PO_4	0.046 mg/L
Lower	10-Oct-06	Composite	Total P	0.0166 mg/L
Lower	10-Oct-06	Composite	Ortho-PO_4	0.0137 mg/L
Harris	25-Jul-06	Composite	Total P	0.143 mg/L
Harris	25-Jul-06	Composite	Ortho-PO_4	0.050 mg/L

Because phosphorus is the limiting nutrient in these lakes, we endeavored to quantify its sources to each lake. There are no wastewater treatment discharges in the study area, so we evaluated nonpoint sources of phosphorus, that is, phosphorus in stormwater runoff from lands draining to each lake. Phosphorus loads were estimated for each lake using the unit area loading method (Reckhow *et al*. 1980). These loads were then used in an empirical lake response model to estimate mean annual total phosphorus concentrations (Reckhow and Chapra 1983). The model was calibrated to reasonably approximate the results of the July 25, 2006 lake sampling. Because these lakes essentially have no outlet for flushing, the major sink for phosphorus in all six lakes is settling. As pointed out by Harza in their 1990 feasibility study, nearly all nutrients entering these lakes settle and become available for internal recycling each year. Lakes such as these are therefore very sensitive to nutrient loading and deserve extra diligence for protection. Appendix B provides input and output details on the lake and watershed phosphorus modeling. The results are summarized below.

Table 3-13 and 3-14 provide a phosphorus load source assessment for each lake. The Clear Lake load estimate includes treatment provided by the alum doser and sedimentation basin on the southwest corner of the lake.

Table 3-13

ESTIMATED MEAN ANNUAL PHOSPHORUS LOADS

(in kg P per year)

Source (Sink)	Clear	Lower	Pine	Harris	Stone	Lily
Atmosphere	7.9	3.1	46	3	13	2
Low Intensity Residential	0.9	1.9	32	1	9	3
High Intensity Residential	1.4	1.7	6	1	5	6
Commercial/Industrial/Transportation	7.4	0	6	1	1	11
Deciduous Forest	0.7	0.2	27	0	4	1
Evergreen Forest	0.6	0.2	18	0	3	0
Upland Grasses & Forbs	0.3	0.1	6	0	0	0
Pasture/Hay	0.3	0.3	82	0	4	0
Row Crops	2.1	0.4	191	0	31	0
Urban/Recreational Grasses	0.7	0	6	0	1	0
(Woody Wetlands)	-0.3	0	-8	0	-1	0
(Emergent Herbaceous Wetlands)	-0.2	-1.6	-8	-1	-1	-1
Total	21.9	6.5	404	6.6	67.5	23.3

The major source areas of phosphorus for each lake can be identified by examining Table 3-14. Because of the small watersheds and current level of air pollution in the region, atmospheric loads of phosphorus are the largest source to Clear Lake, Lower Lake and Harris Lake. This source is beyond the ability of local stakeholders to control, falling to the agencies implementing the Clean Air Act (US EPA and IDEM). Agricultural row crops (corn and beans) are the largest source of phosphorus loads to Pine and Stone Lakes. Impervious surfaces of building roofs, parking lots and streets are the largest source of phosphorus to Lily Lake, and the second largest source for Clear Lake.

Table 3-14

ESTIMATED MEAN PHOSPHORUS LOADS

(fraction per year)

Source (Sink)	Clear	Lower	Pine	Harris	Stone	Lily
Atmosphere	36%	48%	11%	45%	19%	10%
Low Intensity Residential	4%	30%	8%	21%	13%	13%
High Intensity Residential	6%	26%	2%	20%	7%	28%
Commercial/Industrial/Transportation	34%	0%	2%	17%	2%	49%
Deciduous Forest	3%	4%	7%	4%	6%	2%
Evergreen Forest	3%	4%	4%	2%	4%	2%
Upland Grasses & Forbs	1%	1%	1%	0%	0%	0%
Pasture/Hay	2%	5%	20%	1%	5%	0%
Row Crops	9%	7%	47%	5%	45%	0%
Urban/Recreational Grasses	3%	1%	1%	0%	2%	1%
(Woody Wetlands)	-1%	-1%	-2%	-3%	-2%	-1%
(Emergent Herbaceous Wetlands)	-1%	-24%	-2%	-13%	-2%	-3%

3.8 Nitrogen

Nitrogen is also an essential nutrient in plant and animal growth. Like phosphorus however, in high concentrations it can also impair ecosystem balance and health. Natural waters contain nitrogen in the form of organic (or biomass) nitrogen, or in inorganic forms such as ammonia (NH_3), nitrate (NO_3) or nitrite (NO_2). Inorganic nitrogen is used by aquatic plants for growth, and can cause algal blooms. In anaerobic waters, ammonia may be the prevalent form of nitrogen. In aerobic waters nitrate is usually the predominant form. The Indiana Trophic State Index contains metrics for organic nitrogen, nitrate, and ammonia nitrogen. In this study, ammonia nitrogen, nitrate and nitrite, and Kjeldahl nitrogen were all measured in each lake. Kjeldahl nitrogen (TKN) is a measure of organic plus ammonia nitrogen.

Table 3-15 compiles all nitrogen measurements that we have been able to locate for Clear Lake. By comparison to other Indiana lakes, nitrogen concentrations in Clear Lake are intermediate (IDEM 1986).

Table 3-15

NITROGEN DATA AVAILABLE FOR CLEAR LAKE

(Sources: STORET, IDEM, Harza, this study)

Lake	Date	Sample Type	Parameter	Result
Clear	6-Aug-75	unknown	NO_3 +NO_2	0.1 mg/L as N
Clear	6-Aug-75	unknown	Organic N	0.70 mg/L as N
Clear	18-Jul-95	Epilimnion	Ammonia N	0.018 mg/L as N
Clear	18-Jul-95	Hypolimnion	Ammonia N	0.018 mg/L as N
Clear	18-Jul-95	Epilimnion	NO_3 +NO_2	0.038 mg/L as N
Clear	18-Jul-95	Hypolimnion	NO_3 +NO_2	0.022 mg/L as N
Clear	18-Jul-95	Epilimnion	TKN	0.628 mg/L as N
Clear	18-Jul-95	Hypolimnion	TKN	0.624 mg/L as N
Clear	13-Jul-99	Epilimnion	Ammonia N	0.063 mg/L as N
Clear	13-Jul-99	Epilimnion	NO_3 +NO_2	0.022 mg/L as N
Clear	13-Jul-99	Epilimnion	TKN	0.84 mg/L as N
Clear	25-Jul-06	Composite	Ammonia N	0.026 mg/L as N
Clear	25-Jul-06	Composite	NO_3 +NO_2	0.048 mg/L as N
Clear	25-Jul-06	Composite	TKN	0.889 mg/L as N

Historic and current nitrogen measurements for Stone Lake are tabulated below. By comparison to other Indiana lakes, nitrogen concentrations in Stone Lake are also intermediate (IDEM 1986).

Table 3-16

NITROGEN DATA AVAILABLE FOR STONE LAKE
(Sources: STORET, IDEM, this study)

Lake	Date	Sample Type	Parameter(s)	Result
Stone	7-Aug-75	unknown	NO_3 +NO_2	0.1 mg/L as N
Stone	7-Aug-75	unknown	Ammonia	0.01 mg/L as N
Stone	7-Aug-75	unknown	Organic N	1.60 mg/L as N
Stone	16-Aug-89	Epilimnion	Ammonia N	0.039 mg/L as N
Stone	16-Aug-89	Hypolimnion	Ammonia N	0.451 mg/L as N
Stone	16-Aug-89	Epilimnion	NO_3 +NO_2	2.521 mg/L as N
Stone	16-Aug-89	Hypolimnion	NO_3 +NO_2	0.002 mg/L as N
Stone	18-Jul-95	Epilimnion	Ammonia N	0.053 mg/L as N
Stone	18-Jul-95	Hypolimnion	Ammonia N	0.433 mg/L as N
Stone	18-Jul-95	Epilimnion	NO_3 +NO_2	0.07 mg/L as N
Stone	18-Jul-95	Hypolimnion	NO_3 +NO_2	0.022 mg/L as N
Stone	18-Jul-95	Epilimnion	TKN	0.55 mg/L as N
Stone	18-Jul-95	Hypolimnion	TKN	1.303 mg/L as N
Stone	13-Jul-99	Epilimnion	Ammonia N	0.018 mg/L as N
Stone	13-Jul-99	Hypolimnion	Ammonia N	0.245 mg/L as N
Stone	13-Jul-99	Epilimnion	NO_3 +NO_2	0.022 mg/L as N
Stone	13-Jul-99	Hypolimnion	NO_3 +NO_2	0.022 mg/L as N
Stone	13-Jul-99	Epilimnion	TKN	0.863 mg/L as N
Stone	13-Jul-99	Hypolimnion	TKN	1.293 mg/L as N
Stone	25-Jul-06	Composite	Ammonia N	0.185 mg/L as N
Stone	25-Jul-06	Composite	NO_3 +NO_2	0.020 mg/L as N
Stone	25-Jul-06	Composite	TKN	0.930 mg/L as N

Historic and current nitrogen measurements for Pine Lake are tabulated below. Nitrogen concentrations in Pine Lake are generally similar to those measured in Stone Lake.

Table 3-16

NITROGEN DATA AVAILABLE FOR PINE LAKE

(Sources: IDEM, this study)

Lake	Date	Sample Type	Parameter	Result
Pine	21-Aug-89	Epilimnion	Ammonia N	0.052 mg/L as N
Pine	21-Aug-89	Hypolimnion	Ammonia N	1.367 mg/L as N
Pine	21-Aug-89	Epilimnion	NO_3 +NO_2	3.077 mg/L as N
Pine	21-Aug-89	Hypolimnion	NO_3 +NO_2	3.164 mg/L as N
Pine	13-Jul-99	Epilimnion	Ammonia N	0.052 mg/L as N
Pine	13-Jul-99	Hypolimnion	Ammonia N	0.692 mg/L as N
Pine	13-Jul-99	Epilimnion	NO_3 +NO_2	0.022 mg/L as N
Pine	13-Jul-99	Hypolimnion	NO_3 +NO_2	0.022 mg/L as N
Pine	13-Jul-99	Epilimnion	TKN	0.605 mg/L as N
Pine	13-Jul-99	Hypolimnion	TKN	0.92 mg/L as N
Pine	25-Jul-06	Composite	Ammonia N	0.388 mg/L as N
Pine	25-Jul-06	Composite	NO_3 +NO_2	<0.017 mg/L as N
Pine	25-Jul-06	Composite	TKN	1.18 mg/L as N

Fewer measurements of nitrogen concentrations have been made in Lily Lake, and prior to this study, none had been made in Lower or Harris Lakes (Table 3-17). TKN concentrations in Lily, Lower and Harris are higher than the other three lakes, and likely reflect the high plankton blooms in these three lakes.

Table 3-17

NITROGEN DATA AVAILABLE FOR LOWER, LILY AND HARRIS LAKES
(Sources: STORET, this study)

Lake	Date	Sample Type	Parameter	Result
Lily	22-Jul-76	Unknown	Ammonia N	0.1 mg/L as N
Lily	22-Jul-76	Unknown	Organic N	1.2 mg/L as N
Lily	25-Jul-06	Composite	Ammonia N	1.56 mg/L as N
Lily	25-Jul-06	Composite	NO_3 +NO_2	0.047 mg/L as N
Lily	25-Jul-06	Composite	TKN	3.15 mg/L as N
Lower	10-Oct-06	Composite	Ammonia N	0.126 mg/L as N
Lower	10-Oct-06	Composite	NO_3 +NO_2	0.086 mg/L as N
Lower	10-Oct-06	Composite	TKN	1.77 mg/L as N
Harris	25-Jul-06	Composite	Ammonia N	0.017 mg/L as N
Harris	25-Jul-06	Composite	NO_3 +NO_2	0.22 mg/L as N
Harris	25-Jul-06	Composite	TKN	2.00 mg/L as N

3.9 Indiana Trophic State Indices

Several trophic state indices are used around the country for classifying and managing lakes. The State of Indiana has long utilized an index representing lake trophic status. The Indiana Trophic State Index, ITSI, is computed as the sum of scores from ten metrics (IDEM 1986). The ITSI metrics represent ranges of nutrients, DO, water clarity and light penetration, and plankton content in the lake during summer. Points are added for the ten metrics to produce an ITSI score between 0 and 75. The highest quality lakes have low scores, are Class I lakes, and are considered to be oligotrophic; these lakes have an ITSI between 0 and 25. Class II lakes, intermediate quality lakes, are considered as mesotrophic and have an ITSI between 26 and 50 points. Eutrophic lakes are the lowest quality lakes, are Class III lakes, and have an ITSI between 51 and 75.

Aquatic macrophytes are not represented in the ITSI. It is important to consider macrophytes in the management of these lakes; for example, aquatic macrophytes have a significant influence on the macroinvertebrate and fish communities and the water quality of Clear Lake. The ITSI alone is not a comprehensive indicator for lake management.

The 2006 ITSI for five of the six lakes are given in Table 3-18 and Exhibit 8. Historic ITSI are also tabulated below. Under the ITSI system, the 2006 values place Harris and Lily in Class II, mesotrophic lakes, and Clear, Pine and Stone are Class I oligotrophic lakes. Clear Lake, and perhaps Lily and Pine Lakes, seem to have ITSI values decreasing (improving) over time. Lower Lake was not amenable to computation of ITSI, and really should be considered and managed as a wetland rather than a lake.

Table 3-18

INDIANA TROPHIC STATE INDICES FOR THE LAKES

(Sources: IDNR and this study)

Name	1972-79	1980-88	1989	1994-96	1999	2006
Clear Lake	30	26	22	9	7	12
Lily Lake	55			20	11	27
Pine Lake	22	30		21	5	17
Stone Lake	6	25		19	18	14
Harris Lake						26

Exhibit 9 is a correlation matrix for the ITSI and several water quality measurements, many of which are included as metrics in the ITSI. Exhibit 9 shows Pearson correlation coefficients; p-values less than 0.05 (shown as shaded cells in Exhibit 9) are considered to illustrate a significant association, either positive or negative, with the opposing variable. The shaded cells illustrate that improvements in plankton levels (that is, reduced algal blooms) should results in higher water clarity and increased light penetration, implicitly improving conditions for rooted macrophytes.

3.10 Coliform Bacteria

This study did not sample water for analysis of coliform bacteria. The La Porte County Health Department monitors swimming beaches on Pine and Stone Lakes during the swimming season (Memorial Day to Labor Day). Historic data are available on their website and we downloaded it for evaluation of trends and patterns. Appendix C includes the data, plots, and statistical analyses. One notable correlation found in the beach data was a rather strong positive association between the number of days that the beaches were closed each year and the number of sampling events (Pearson correlation coefficient =0.611, p=0.000). In order words, more frequent testing is associated with increased detection of water quality standard violations. Coliform bacteria concentrations have a naturally high variability, and this correlation analysis illustrates this point. Coliform sampling and testing need to be frequent in order to detect temporal variations and occasional high levels.

The new swim beach on Stone Lake has more closures each year than the other five beaches (Figure 18). The box-and-whisker plot (Figure 18) displays the number of days each beach was closed each year between 1991 and 2005. The box is bounded on the bottom by the 25th percentile and on the top by the 75th percentile; and the line connects the median days closed for each beach. The "whiskers" indicate the general range of the data for each beach, while asterisks indicate potential outliers. While contamination by sewage cannot be dismissed, the new beach on Stone Lake has the highest public use of all the beaches in La Porte. Swimming is known to contaminate water (Elmir *et al*. 2007), as are birds (gulls, waterfowl). These are also possible causes of the higher closure rate at the new beach on Stone Lake.

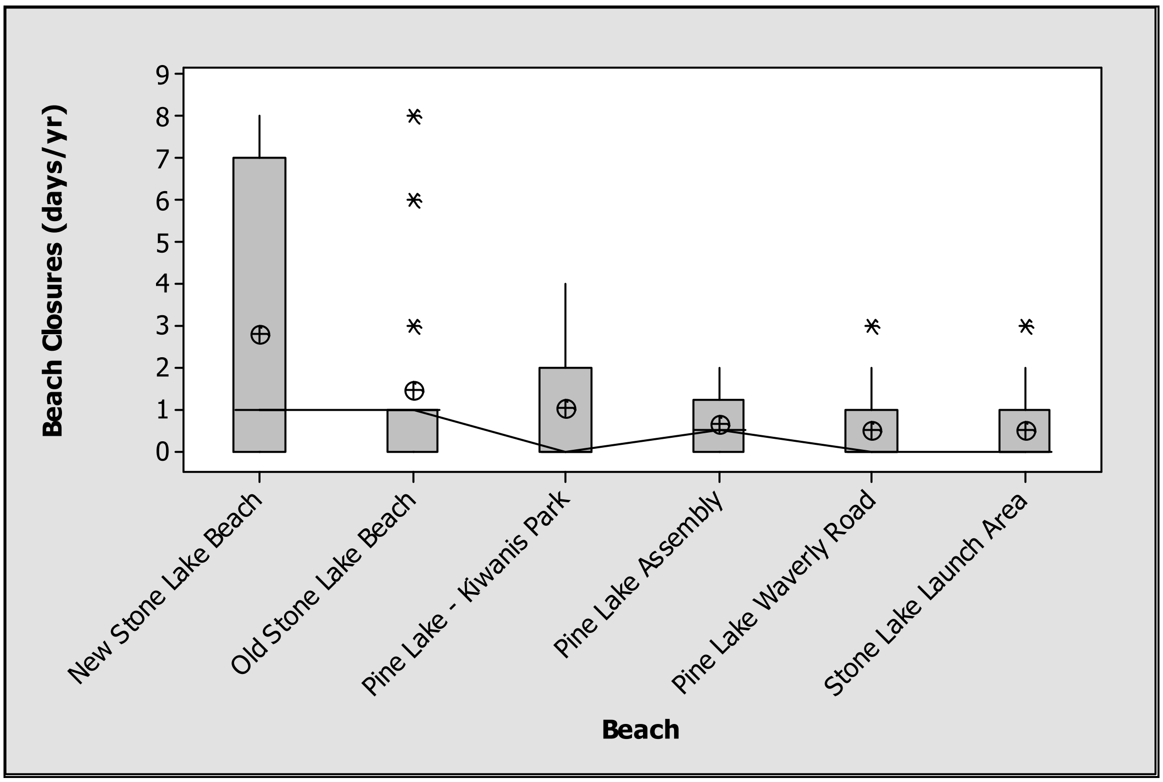

Figure 18. Annual Closings of La Porte's Swimming Beaches.

3.11 Sediment Contamination

This study did not sample sediments for analysis. Limited historic data are available on sediment contamination. Consultation with the Indiana Department of Environmental Management found that they have no records of ever sampling sediment from any of the lakes in this study. However, Baetis searched STORET and found some data on heavy metals in sediment in Stone and Clear Lakes. Clear Lake and Stone Lake are the only lakes with data in STORET. Sediment data are limited to cadmium (Cd), lead (Pb) and zinc (Zn). All available data are from 1973. Summary statistics are tabulated below.

Table 3-19

SUMMARY STATISTICS (mg/kg) FOR METALS IN LAKE SEDIMENT

(Source: STORET)

Lake	Contaminant (mg/kg)	N	Mean	Standard Deviation	Min	Max
Clear	Cadmium	7	3.7	1.4	2.1	6.6
Clear	Lead	7	458	304	244	1130
Clear	Zinc	7	679	233	469	1180
Stone	Cadmium	8	2.7	0.7	1.45	3.7
Stone	Lead	10	184	59	87	275
Stone	Zinc	10	487	225	292	1080

To put the above data in perspective, we reference the Calumet Area Ecotoxicology Protocol (Calumet Ecotoxicology Roundtable, 2007). That protocol reviews the ecotoxicological effects of contaminants, as derived from the scientific literature, and recommends a set of benchmarks for use in ecological risk assessments while rehabilitating formerly used industrial sites in the Lake Calumet area. The Protocol benchmarks can be broadly applied to habitats in the southern Lake Michigan area. The benchmarks represent concentrations that are expected to impact ecological receptors, that is, those plants and animals exposed to the contaminated sediment. The benchmark for cadmium is 4.98 mg/kg; for lead, 128 mg/kg, and for zinc, 459 mg/kg. The mean concentrations of lead and zinc in Stone and Clear Lakes exceed the benchmark. The cadmium benchmark is also exceeded in one location in Clear Lake. Exceedance of the benchmark implies that these contaminants are present at levels high enough to cause adverse ecological effects, primarily upon benthic organisms or communities. The maps below show the sampling locations and concentrations of metals relative to the benchmark values, with darker spots indicating concentrations of metals greater than the benchmark value.

We recommend that, as resources allow, the IDEM update and expand the sediment contamination database by testing th4e sediment all six lakes in this study. We also recommend evaluation of the two ponds on the former Allis Chalmers property, as they are at a high risk of harboring industrial contamination and they are connected to Clear Lake by a storm drain. The sediment testing should be performed in conjunction with analysis of fish tissue from the lakes.

Figure 19. Cadmium Levels in Sediment in Stone and Clear Lakes (Source: STORET)

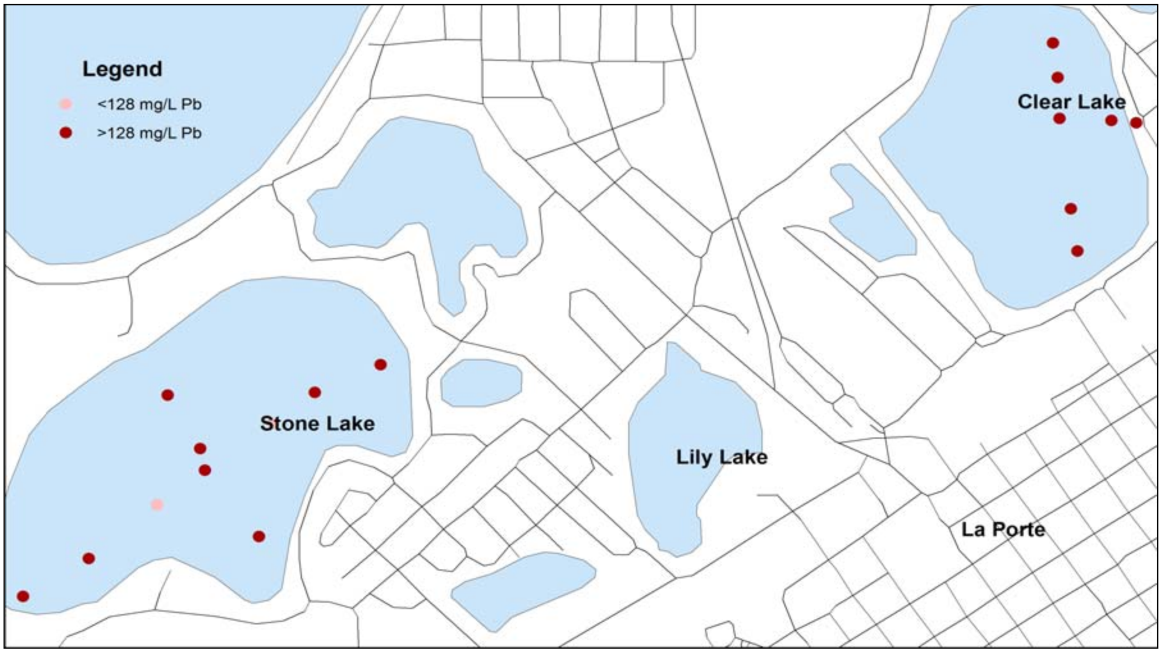

Figure 20. Lead Levels in Sediment in Stone and Clear Lakes (Source: STORET)

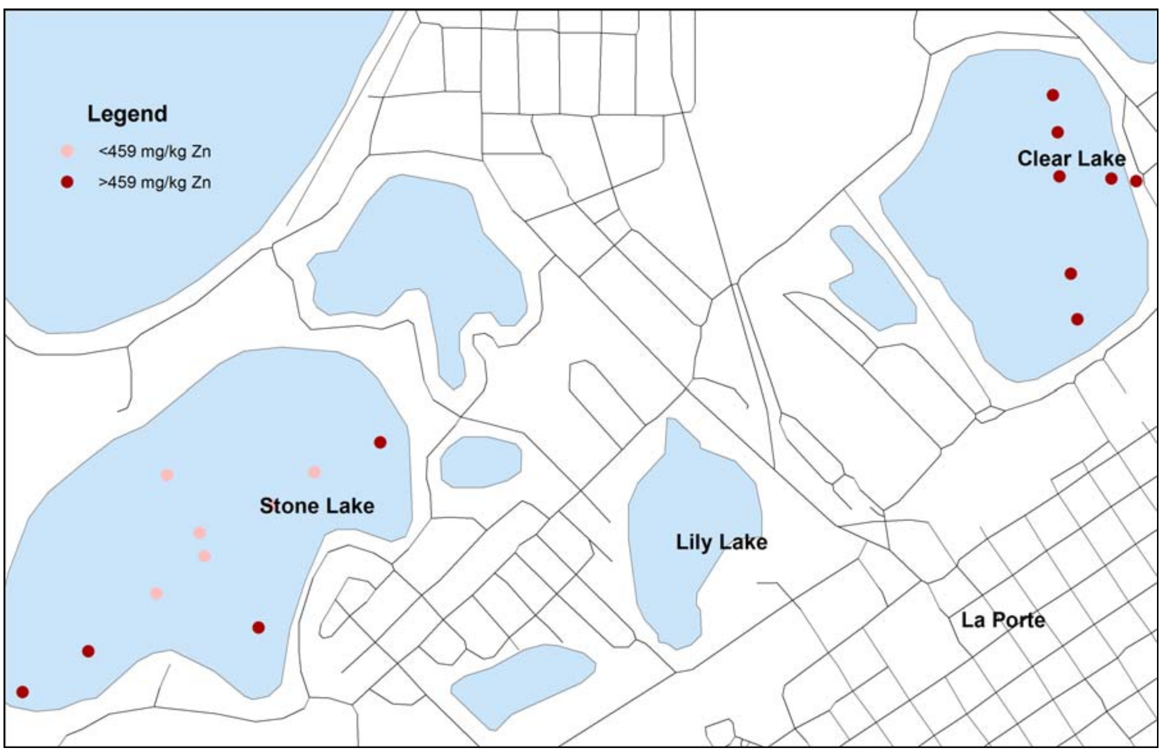

Figure 21. Zinc Levels in Sediment in Stone and Clear Lakes (Source: STORET)

3.12 Fish Tissue Contamination

Baetis consulted with the Indiana Department of Environmental Management and obtained fish tissue data from Stone Lake. Fish tissue data are not available for the other lakes. We recommend that, in association with sediment testing, the lakes have the fish tissue contaminant database expanded so that consumers are aware of any risk inherent in eating locally caught fish.

The analyses of Stone Lake fish tissue were performed on sunfish and bullhead fillets collected in 1999 (Appendix D). These data, and other data like these, are the basis for the State of Indiana's Fish Consumption Advisory.

The only lake in La Porte on the 2006 Fish Consumption Advisory is Stone Lake, where black crappie is in Advisory Group 1 (unrestricted consumption, one meal per week for women who are pregnant or breast-feeding, women who plan to have children, and children under the age of 15). This listing is based on the 1999 fish tissue analysis and the presence of mercury, DDT breakdown products, and PCB in fish tissue from Stone Lake.

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4.0 LAKES ASSESSMENT

In the early 1880s, Lower, Clear, Lily and Stone Lakes formed a single 1.3-mi^2 lake. Pine and North Lakes formed a slightly larger lake (Tucker 1922). Activities related to agricultural drainage, urbanization and industrial development reduced the lake areas to their current sizes, about half of original extents.

Exhibit 10 is a bathymetric map of Stone and Pine Lakes from 1922, provided by the Indiana DNR. A bathymetric map of Clear Map from 1957 is included as Exhibit 11.

4.1 Physical Characteristics

Table 4-1

PHYSICAL CHARACTERISTICS OF SELECTED LA PORTE LAKES

Lake	Drainage Area (mi^2)	Surface Area (ac)	Watershed to Lake Area Ratio	Volume (ac-ft)	Max Depth (ft)
Pine	8.82	543	10.4	-	71
Stone	1.41	149	6.0	-	36
Harris	0.17	35	3.1	-	-
Lily	0.48	28	10.9	-	~30
Lower	0.17	36	3.0	-	-
Clear	0.65	97	4.5	758	12

4.2 Biological Communities

This section addresses the biological communities of the lakes, including plankton, aquatic plants, and fish.

4.2.1 Plankton

Plankton samples were collected on July 25, 2006 in all lakes except Lower Lake, where there was insufficient water for even a horizontal tow. Lower Lake was sampled on October 10, 2006 after late summer rains refilled it. All plankton samples were collected using a Fieldmaster® plankton net (80-micron mesh opening; mouth radius 9.84 cm) fitted with a 125 mL polyethylene bottle and tow line calibrated in decimeters. Collections consisted of a single vertical tow from the 1% light level to the surface at the deepest point of each lake with the exception of Lower Lake where shallowness necessitated a horizontal tow for one (1) meter. In the field, each sample was preserved by adding 1 mL of Lugol's solution, wrapping the collection bottle in aluminum foil, and placing the sample on ice in a cooler. Prior to enumeration, samples were stored in a refrigerator.

Four 1 mL subsamples were taken with a volumetric pipette from each plankton sample for identification and enumeration. Each subsample was placed in a Sedgwick-Rafter gridded counting chamber comprised of 1000 one-mm^2 cells. Organisms from 25 random cells were identified and enumerated under a magnification of 100X using an Olympus CH 30 light microscope.

The number of organisms from each subsample was calculated using:

$$\text{No. Organisms} = P \times 40 \times V_1 / V_2 \qquad \text{(Eq. 1)}$$

Where P is the total number organisms in 25 Sedgwick-Rafter cells, 40 is a scaling factor, V_1 is the concentrated volume of the original sample, and V_2 is the theoretical volume of lake water filtered. Theoretical volume of lake water filtered was determined using Equation 2:

$$V_2 = A \times D \qquad \text{(Eq. 2)}$$

where A is the mouth area of the net and D is the vertical distance of the tow. The numbers of organisms in this report represent the average of the four subsamples. Colonial and filamentous organisms were counted as a single organism.

The plankton data reveal some interesting aspects of the lakes. Pine and Stone Lakes had very low plankton concentrations, typical of oligotrophic low productivity lakes (Wetzel 2001). Clear Lake had an intermediate concentration of plankton, while Lower, Lily and Harris showed higher numbers more typical of mesotrophic lakes (Table 4-2, Exhibits 12 and 13, Figure 22).

Table 4-2

AVERAGE PLANKTON DENSITIES (units per L)

Plankton Group	Clear	Harris	Lily	Lower	Pine	Stone
Phytoplankton						
Misc. colonial	3948	6927	2987	3961	372	501
Misc. Filamentous	-	-	-	7923	-	-
Misc. Protists	3589	29912	1972	2641	358	167
Chlorophyta						
Actinastrum sp.	718	-	-	440	-	-
Pediastrum sp.	205	472	1301	440	165	24
Oedogonia sp.	-	-	-	-	110	-
Scenedesmus sp.	1179	630	-	880	-	-
Ulothrix sp.	-	-	1507	-	124	-
Chromophyta						
Asterionella sp.	103	——	——	——	——	——
Dinobryon sp.	——	——	——	——	69	——
Fragilaria sp.	1179	1417	——	440	179	286
Stephanodiscus sp.	——	——	616	440	179	83
Cyanophyta						
Anabaena sp.	51	——	——	——	276	131
Microcystis sp.	308	——	10451	——	165	620
Oscillatoria sp.	51	787	3314	880	138	48
Woronichinia sp.	103	——	——	——	96	12
Pyrrophyta						
Ceratium sp.	359	——	2315	——	661	989
Zooplankton						
Arthropoda						
Cladocerans	359	157	4629	9683	——	24
Copepods	256	315	2150	——	——	——
Misc. Nauplii	410	1102	1192	440	——	——
Rotifera						
Keratella sp.	154	——	479	——	124	48
Misc. Rotifers	308	315	630	——	124	95

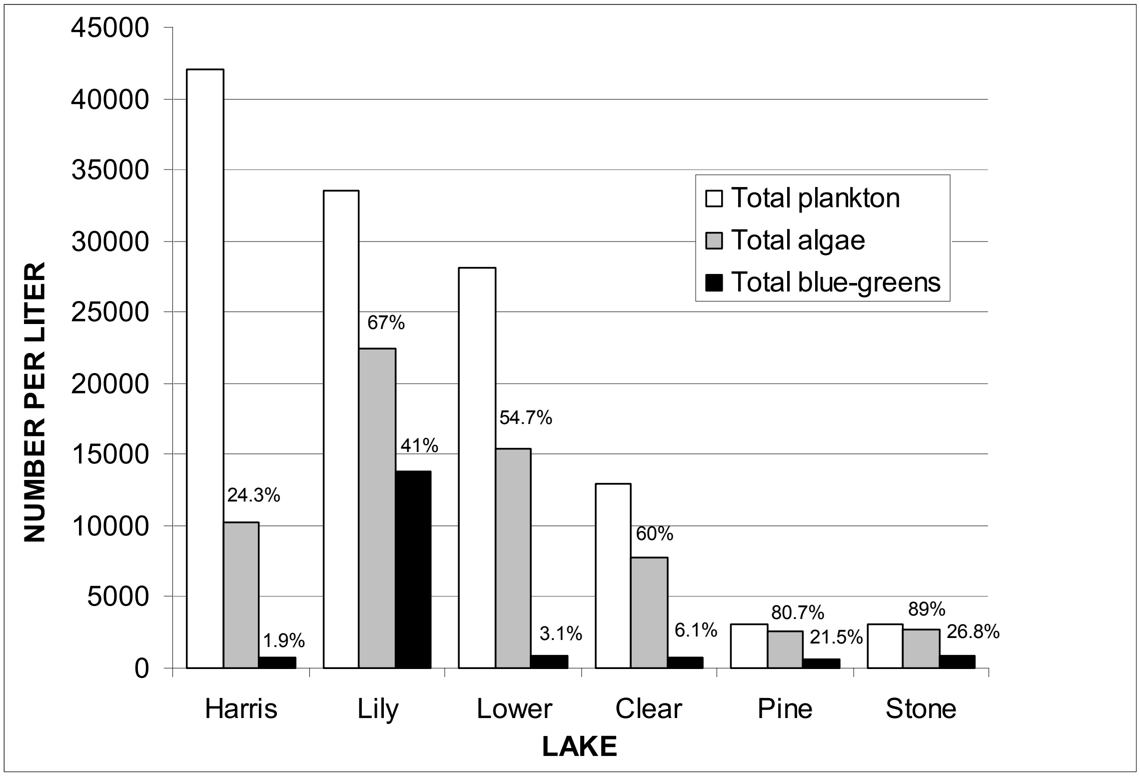

Figure 22. Comparison of Plankton, Algae, and Blue-Green Algae in the Study Lakes.

With the productivity of aquatic macrophytes in Clear Lake, it was somewhat surprising that plankton values were not greater. The high plankton productivity in Lower, Lily and Harris Lakes, given the extensive muck bottoms consisting largely of organic remains of aquatic plants, is not unexpected. Release of mineral nutrients and dissolved and particulate carbon from the sediments and senescing aquatic plants, contributes to increases in phytoplankton populations, with a concomitant increase in zooplankton (Sheffer 1998).

The relatively small proportion of total plankton that is phytoplankton in Harris Lake (24.3%) is different than for Lower and Lily Lakes. There were only a small number of cladocerans, copepods, and rotifers in Harris Lake and zooplankton present were almost all ciliated protozoans which are largely bactivorous in habit (Beaver and Crisman 1982). We speculate that fish, likely bluegill and other small sunfishes, have selectively grazed the larger populations of zooplankton. Whatever the cause, there must have been high bacterial populations in Harris Lake at the time of plankton sampling to support high protist numbers.

None of the six lakes was dominated by blue-green algae, although a few lakes had a substantial representation of this group as a percentage of total plankton. The highest percentage of blue-greens was in Lily Lake (41%) followed by Stone Lake (26.8%), Pine Lake (21.5%), Clear Lake (6.1%) and Lower and Harris (3.1% and 1.9%, respectively).

While Lily and Stone Lakes do not necessarily have disparate percentages of blue-green algae, 41% and 27%, this statistic alone is misleading. Lily Lake has over ten times the actual plankton numbers of Stone Lake (Figure 22). In Stone Lake, 89% of plankton is phytoplankton whereas only 24.3% of total plankton is phytoplankton at Lily Lake. Total phytoplankton productivity at Lily Lake is actually only 2.5 times that of Stone Lake. Therefore most of the difference in productivity at Lily Lake when compared with Stone Lake is due to zooplankton abundance.

Blue-green algae contribute to high turbidity in lakes. Colonial species such as *Microcystis* have a greater ability to regulate their buoyancy than single-celled species to stay optimally positioned in the water column to maximize photosynthesis, especially as the photic zone occupies less and less of the vertical profile of the lake. The presence of more colonial species by mid-summer is also a strategy for phytoplankton to prevent grazing by zooplankton, particularly cladocerans (which are very abundant in Lily Lake) (Harris 1986).

Colonial blue-green species can cause aesthetic nuisances in lakes when they get trapped by surface tension at the water's surface and form scums and mats. Nevertheless, their high abundance near the surface causes self-shading and a decrease in light levels to other plankton and rooted aquatic vascular plants. The filamentous blue-green algae are more of a concern in lake management because they can undergo rapid growth and form blooms. Blue-green algae can respond to appropriate conditions for growth better than most algae because they have the ability to utilize nitrogen from the atmosphere.

Recent evidence indicates that the abundance of blue-green algae can be more closely associated with lake turbidity and water clarity than to phosphorus levels (Sas 1989; Jeppesen *et al*. 2005). Thus there is often a time lag in lake improvements even after nutrient sources are removed for one year (Welch and Jacoby 2004). Remobilization of phosphorus from sediments can contribute to this time lag of up to decade before any improvement is seen (Jeppeson *et al*. 2005).

In Lily Lake, excessive plankton growth has contributed to a decline in the aquatic plant community. Unlike algae, few aquatic plants can grow at a point below the five percent light level. Therefore, excessive shading by blue-green algae, other plankton, and suspended solids in the water column has brought about an almost complete loss of the submerged aquatic plant communities in Lily Lake. The carp population in Lily Lake is a significant factor in the demise of the vegetation in Lily Lake. Carp not only uproot aquatic plants with their bottom feeding activities, but also resuspend sediments and increase turbidity, thus contributing to a greater increase in phytoplankton abundance (Moss *et al*. 1997). While surveying Lily Lake we saw a large number of carp exceeding 20 pounds in weight.

Over three-quarters of the identifiable plankton in Lily Lake are zooplankton such as cladocerans and copepods. There are also a substantial number of nauplii which are likely larval stages of cladocerans. In lakes with little to no populations of planktivorous fish, cladoceran populations can become very large, especially when there is ample phytoplankton on which they can feed. This suggests that Lily and Lower Lakes have few small sunfish (zooplankton feeders).

A discussion of phytoplankton is important relative to other parameters that were measured during this study, especially the depth to which light penetration reaches 1% of the incident light level. The significance of the 1% light level is that it is generally held as the depth limit at which phytoplankton can still photosynthesize. Total plankton abundance is strongly and negatively associated with the depth of 1% light penetration (Pearson correlation coefficient = -0.877, P-value = 0.022). In other words, the shallower the depth of the 1% light level the greater the abundance of total plankton. This makes intuitive sense as plankton absorb light and reduce water clarity. Since the plankton net is pulled from the depth corresponding to a 1% light level it can be seen that this translates into a far greater abundance of plankton in the first few feet of water in lakes such as Lily Lake but few phytoplankton below this level. The turbidity of Lily Lake is indicative of suspended solids in the water column. Since phytoplankton and some zooplankton consume suspended organic carbon there is a general correlation with this parameter and phytoplankton productivity as well. Excessive decomposing aquatic plants and algae can contribute greatly to the release of tannic acids and other organic matter in the water column that can reduce the depth to which light penetrates for aquatic plant growth.

The maintenance of some dense beds of aquatic vegetation are critical as cover for invertebrates such as cladocerans which may show diurnal movements out of the protective cover of plants to feed on phytoplankton at night (Carpenter and Kitchell 1993). Loss of these beds bodes poorly for the survival of healthy invertebrate populations.

Dinoflagellates such as *Ceratium* are often abundant in plankton samples from somewhat deeper lakes (Hutchinson 1968) in mid to late summer because the cells are motile and can situate themselves within the photic zone. In shallower lakes such as Lower, Clear, and Harris they cannot compete for light with the more abundant non-motile green algae and filamentous blue-greens. Figure 23 is a scatterplot illustrating the preference of *Ceratium* for deeper lakes. Interestingly, Lily Lake appears to be an exception to this habitat preference relationship.

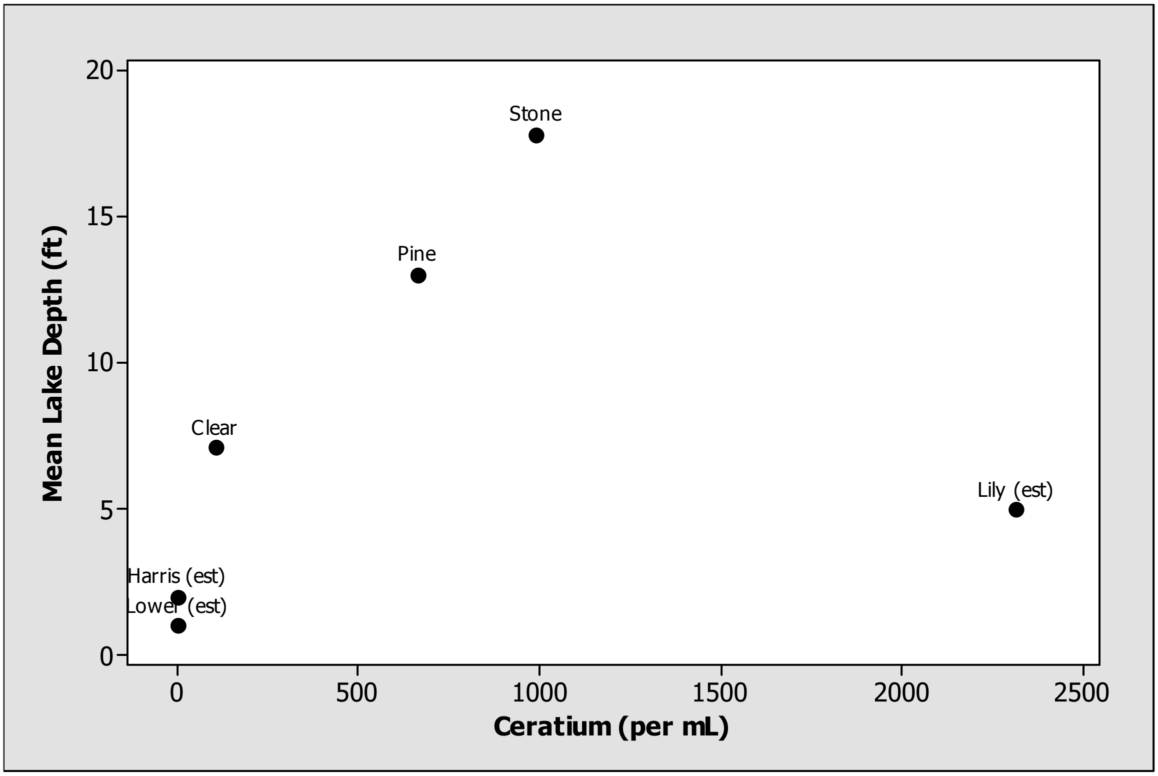

Figure 23. Mean Lake Depth and *Ceratium* Counts.

In Harris and Lower Lakes the high suspended solids concentrations are from resuspension of bottom deposits during sampling. Due to the lakes' shallowness it was difficult to obtain a sample without also pulling up organic matter from near or off the bottom of the lake. No carp or other fish were observed in Harris or Lower Lakes, probably because of the shallowness of these habitats which would not likely allow for overwintering of adult fish populations.

Plankton data are one metric in the Indiana Trophic State Index (ITSI). Table 4-3 reiterates the ITSI values computed for 2006. The comparatively low ITSI values suggest that Pine, Stone, and Clear Lakes are low productivity oligotrophic lakes, whereas Harris and Lily Lakes are of moderate productivity.

Table 4-3

2006 INDIANA TROPHIC STATE INDICES

Lake	Points for Plankton Metric	ITSI
Clear	2	12
Lily	4	27
Harris	5	26
Stone	1	14
Pine	1	17

The use of the ITSI as a single line of evidence of lake trophic state illustrates the limited usefulness of the ITSI without the addition of other limnological factors, such as data on aquatic vascular plants, or invasive species. The high number of miscellaneous algae at Clear Lake is likely indicative of a much higher number of blue-green algae than is suggested by simply tabulating those blue-green algae that were identifiable. A higher blue-green percentage for these lakes would fit with general observations on trophic state in these lakes compared with Stone and Pine Lakes.

4.2.2 Aquatic Macrophytes

Aquatic plants in the six lakes were surveyed during this study. This section describes and maps the aquatic plant communities.

4.2.2.1 Methods

Surveys were performed using LARE's Tier I and Tier II methods. Tier I methods involve surveying the entire lake, identifying species distributions, developing a species list, and circumscribing aquatic plant beds. Tier II methods are intended to define the frequency of occurrence and density of aquatic macrophytes in each lake. Surveys were conducted during July and August 2006. Samples were collected on grids of georeferenced waypoints in each lake. In Tier II, the number of sampling points required to survey a given lake is based on the lake's surface area and trophic state (Exhibit 14). Grid intervals were manipulated for each lake in an attempt to adhere to these criteria. Note that the sample size criteria in Exhibit 14 are not based on empirical data or statistical formulae, but rather represent an effort to ensure that each of the contour intervals is represented in the sampling effort (C. Rich, pers. comm.). Table 4-4 gives the number of aquatic plant sampling points for each depth contour for each lake. Note that shore areas (above the zero depth mark) were not included in the survey.

Table 4-4

NUMBERS OF AQUATIC PLANT SAMPLING POINTS†

Contour Interval	Clear Lake	Harris Lake	Lily Lake	Pine Lake	Stone Lake
0-5 ft	24(10)	29(10)	24(10)	138(22)	66(14)
5-10 ft	26(10)	1(10)	1(10)	59(21)	23(14)
10-15 ft	0(10)	0(7)	0(5)	11(19)	11(12)
15-20 ft	0(10)	0(3)	2(3)	18(18)	13(10)
20-25 ft	0(10)	———	0(2)	11(10)	———
Total	50(60)	30(30)	27(30)	237(90)	113(50)

† Parenthetical values represent the recommended number of sampling points from the Tier II protocol (Exhibit 14).

Once the appropriate grid interval was determined for each lake, grid themes, utilizing a randomly selected point of origin, were generated for each lake. The grid themes and orthophotographs of lakes were exported for field locating using a Trimble GeoXT™ global positioning system (GPS) unit outfitted with a Trimble Beacon-on-a-Belt (BoB™) real-time differential corrected receiver.

With the exception of Lower Lake, each waterbody was surveyed by using a quantitative rake method modified from Pearson (2004). The modifications were: 1) a single-headed garden rake was substituted for a doubled-headed rake; 2) the rake head was not attached to a rope, but rather it was affixed to an extendable pole marked in one decimeter intervals and capable of sampling to the 30 ft contour; 3) instead of using the boat and motor to drag the rake a distance of 10 ft, rake samples were manually retrieved by hand at a distance of 1.0 m and represented a coverage area of 0.35 m^2 [i.e. 1/3 the theoretical sampling area as calculated from Pearson (2004)]. This modification of the technique limited damage to aquatic plant beds while providing field scientists with abundant plants in each sample.

The frequency of occurrence and mean density were calculated for each taxon. Frequency of occurrence values represented the percentage of sampling points from which a given taxon was present. Raw frequency values were relativized by dividing the frequency of an individual taxon by the sum frequency for all taxa. Mean density values equaled the sum of all density values for a given taxon from a specific lake divided by the total number of occurrences for that taxon.

Lower Lake was not navigable for most of the sampling season because of the extreme shallowness and treacherous thick mud. With heavier rains in early fall we were finally able to partially negotiate the lake by kayak. It was possible to walk some areas as long as one stayed on the spatterdock tubers. Since there were no definable beds of submerged aquatic plants to map, and sampling at many distinct points was very difficult, we used a modified Braun-Blanquet relevé method. Sampling of Lower Lake was done by surveying two 120 m^2 near-shore sites: one located on the northeast portion of the lake and the other directly off the northwest shore. Taxa were assigned to abundance categories based on estimates of percent cover. The categories of abundance follow those in Alix and Scribailo (1998) and are defined as follows:

- Rare = coverage up to 9% of the total area of the study site
- Infrequent = coverage between 10% and 19% of the total area of the study site
- Occasional = coverage between 29% and 49% of the total area of the study site
- Common = coverage between 50% and 74% of the total area of the study site
- Abundant = coverage ≤75% of the total area of the study site

Standard floristic quality indices, FQI, (Swink and Wilhelm 1996) were calculated from data collected from both Tier I and Tier II surveys. Coefficients of conservatism (C values) proposed by Rothrock (2004) for Indiana's native aquatic vascular plants were used. A C value assigned to a native vascular plant taxon is represented by an integer ranging from 0 to 10. Each integer theoretically represents an estimated level of fidelity to an area that has remained relatively unaltered from pre-European settlement conditions (Swink & Wilhelm 1994). Taxa having a high C value often appear to be very sensitive to habitat degradation and show fidelity to undisturbed natural areas, whereas taxa having a low C value show little or no fidelity to specific natural communities and can be quite resistant to environmental disturbance. Typically, C values are subjectively assigned to plant taxa of a given region or political boundary based on the judgments made by a committee of professional botanists familiar with particular attributes of their behavior, such as sensitivity to disturbance and patterns of occurrence, independently of their rarity. Non-native species were excluded from the FQI.

The FQI of an area requires a mean coefficient of conservatism (C_{mean}) value, which is calculated as:

$$C_{mean} = \sum C \div N \qquad \text{(Eq. 3)}$$

where $\sum C$ is the sum of all C values of the native aquatic vascular macrophytes recorded from the lake and N is the total number of taxa having C values. The C_{mean} is used to calculate FQI:

$$I = C_{mean} * \sqrt{N} \qquad \text{(Eq. 4)}$$

where $\sqrt{N}$ is the square root of the total number of taxa having C values and serves as an area-based standardization for species richness (so that areas of unequal size can be meaningfully compared). Higher FQI values indicate a lake aquatic plant community with high fidelity and diversity. For further discussion of the relevance and applicability of FQA values to lake studies see Alix and Scribailo (2006).

4.2.2.2 Survey Results

Aquatic plant data from the Tier I and Tier II surveys are discussed below in a single narrative for each lake. A complete list of all taxa of aquatic plants found in the six lakes appears in Exhibits 14 through 16. The exhibits state the common name, taxon identification code, family name and coefficient of conservatism for each species, and a species list for each lake.

FQI calculated from each lake for the Tier I and Tier II surveys are contained in Tables 4-5 and 4-6, respectively. Data from the surveys suggest that Pine and Stone Lakes have the highest quality communities of aquatic flora; Lily Lake has the lowest.

Table 4-5

FLORISTIC QUALITY INDICES USING TIER I DATA

Lake	No. Native Taxa	No. Non-Native Taxa	∑C	Mean C	FQI
Clear	21	4	104	5	22.7
Harris	20	1	88	4.4	19.7
Lily	14	3	59	4.2	15.8
Lower	15	0	52	3.5	13.4
Pine	31	3	197	6.4	35.4
Stone	28	3	183	6.5	34.6

Table 4-6

FLORISTIC QUALITY INDICES USING TIER II DATA

Lake	No. Native Taxa	No. Non-Native Taxa	∑C	Mean C	FQI
Clear	8	2	34	4.3	12
Harris	8	0	40	5	14.1
Lily	4	1	14	3.5	7
Lower	——	——	——	——	——
Pine	20	1	135	6.8	30.2
Stone	17	2	122	7.2	29.6

Note that charophytes (*Chara* and *Nitella*) have not been assigned C values so are not included in the Table 4-5 FQA calculations for Tier I sampling. Non-native species are also excluded, as are those taxa where we could not make a species determination. Consequently, numbers in this table do not necessarily match the species lists for each lake (Exhibits 16 and 17). Tier II values in Table 4-6 also do not match Exhibits 16 and 17 because emergents are excluded, as are species that were not encountered during the quantitative sampling of specific points.

While non-native taxa are not included in the FQI, these data were recorded in the Tier II surveys. The Tier I survey documented four exotics: *Lythrum salicaria* (commonly known as purple loosestrife, purple lythrum, spiked loostrife, spiked lythrum, or rainbow weed), *Myriophyllum spicatum* (Eurasian water-milfoil, European water-milfoil, spiked water-milfoil, shortspike water-milfoil, or Siberian water-milfoil), *Najas minor* (minor naiad, brittle naiad, brittle water-nymph, brittle-leaved water-nymph, brittle-leaved naiad, brittle leaf naiad, or brittle leaf water-nymph), and *Potamogeton crispus* (curly-leaved pondweed, curly pondweed, curly leaf pondweed, Eurasian pondweed, crisped pondweed, or crispy-leaved pondweed). Table 4-7 summarizes the frequency of occurrences of the three non-native submersed species found: *Myriophyllum spicatum* (MYRSPI), *Potamogeton crispus* (POTCRI), and *Najas minor* (NAJMIN). Table 4-8 summarizes the average densities of these plants.

Table 4-7

FREQUENCY (AND RELATIVE FREQUENCY) OF NON-NATIVE SPECIES

Waterbody	MYRSPI	NAJMIN	POTCRI
Clear Lake	94 (41.2)	8 (3.5)	10 (4.4)
Harris Lake	———	———	———
Lily Lake	18.5 (17.2)	18.5 (17.2)	———
Lower Lake	———	———	———
Pine Lake	15 (5)	———	———
Stone Lake	7.1 (1.5)	———	0.9 (0.2)

Table 4-8

AVERAGE DENSITY OF NON-NATIVE SPECIES

Waterbody	MYRSPI	NAJMIN	POTCRI
Clear Lake	4.5	1	1
Harris Lake	——	——	——
Lily Lake	1.8	1.6	——
Lower Lake	——	——	——
Pine Lake	1.1	——	——
Stone Lake	——	1	1

In the majority of cases, the Tier I survey was more useful in providing relevant information about aquatic plant community quality than the Tier II method. Even though we oversampled most of the lakes in terms of number of points required (Table 4-4) it is apparent from comparing Tables 4-5 and 4-6 that the Tier II method underestimated the total number of plant species present. Some of this underestimation is attributable to the fact that emergent plants are not included in a Tier II survey but, even disregarding this fact, the differences in totals remain. Unfortunately, the species that tend to be lost with a Tier II survey tend to be native, rare, and highly conservative. The differences indicate the importance of having a complete species list for diagnostic studies.

The Indiana Trophic State Index, presented earlier, lacks a metric for inclusion of a lake's aquatic plant community. Out of curiosity, we performed a correlation analysis of the ITSI, two metrics included in the ITSI, and the Tier I and Tier II FQI (Tables 4-3, 4-5 and 4-6). As suspected, the overall ITSI score was not significantly associated with the FQI scores from either method ($p > 0.05$). Interesting, given the strength of the association and the small sample sizes (N=5), the depth of 1% light penetration was correlated with higher FQIs from both methods. This likely reflects the strong controls that light has on photosynthesis and macrophyte community quality.

Table 4-9

CORRELATION OF ITSI AND FQI SCORES*

	Plankton density	Depth of 1% light	ITSI	Tier I FQI
Depth of 1% light	-0.877 (0.022)			
ITSI	0.868 (0.056)	-0.605 (0.279)		
Tier I FQI	-0.848 (0.033)	0.959 (0.002)	-0.668 (0.218)	
Tier II FQI	-0.779 (0.12)	0.95 (0.013)	-0.531 (0.357)	0.982 (0.003)

* Pearson Correlation Coefficients and associated P-values

4.2.2.2.1 Lower Lake

Most of the surface of Lower Lake was covered by *Nuphar advena* (spatterdock) with some intermixed patches of *Nymphaea odorata* (white water lily) in areas that were slightly deeper (Figure 24). Other emergent species included small clusters of *Sparganium* (bur-reed) and pickerelweed (*Pontederia cordata*) growing on mudflats.

Although Lower Lake had 19 aquatic plant species recorded (Exhibit 17), it had a depauperate submerged aquatic plant flora with only five submersed species. Overall floristic quality, either from Tier I or Tier II surveys, was very low, particularly from the latter which only includes submersed species.

The shallowness of the water, very peaty flocculent substrate, and dense network of spatterdock tubers limited submersed species diversity. The most abundant submersed species was *Potamogeton foliosus* (leafy pondweed) although it was still sparse in most locations and was not observed in flower or fruit. The other submersed species were sporadic and included *Ceratophyllum demersum* (common coontail), floating-leaved pondweed (*Potamogeton natans*), *Utricularia gibba* (humped bladderwort) and *Utricularia macrorhiza* (common bladderwort). The last species tends to be common in organic rich habitats with high levels of tannins in the water and is one of the few species that can tolerate heavy shading by floating species. Since it also does not form roots, it does not have to compete for establishment in sediments.

Emergent vegetation around the perimeter of the lake included *Sagittaria* (arrowhead) intermixed with *Cyperus bipartitus* (slender flatsedge) and *Cyperus odoratus* (fragrant flatsedge).

Cover estimates according to the abundance ranking system used specifically for Lower Lake indicate spatterdock was abundant, with *Ceratophyllum demersum*, and *Nymphaea odorata* being common. All other species were occasional with the exception of *Pontederia cordata* which was infrequent.

No non-native species were found in Lower Lake.

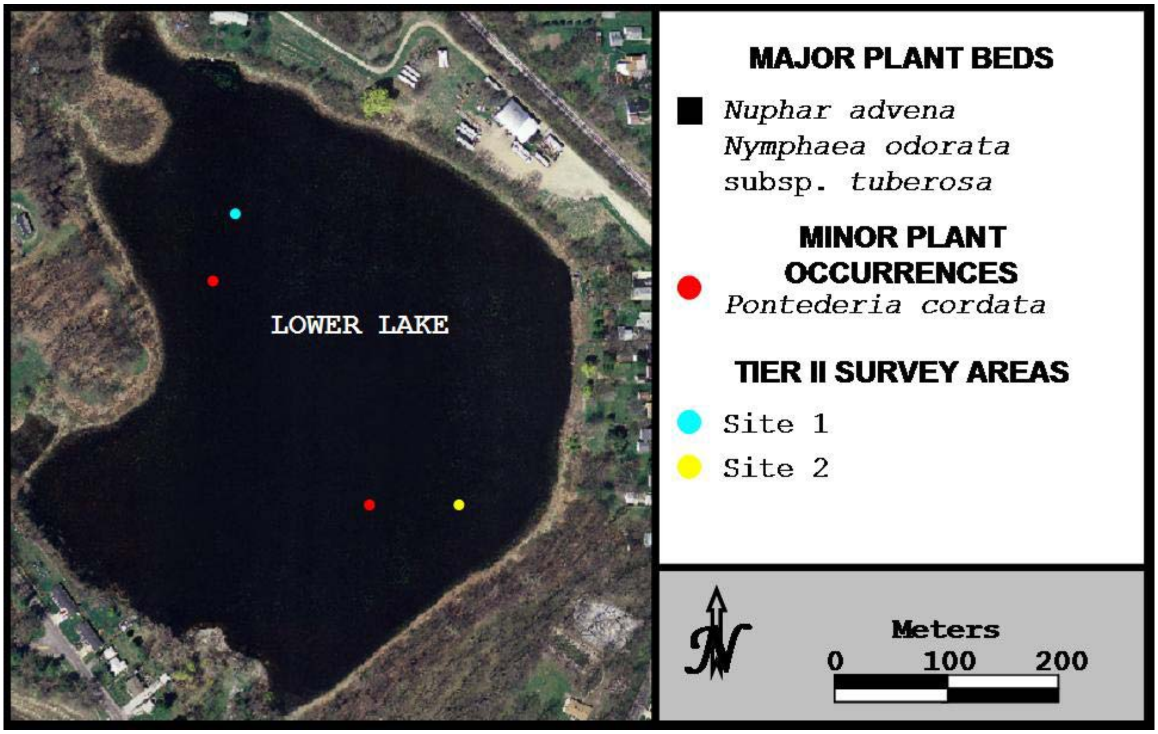

Figure 24. Aquatic Plant Communities in Lower Lake.

4.2.2.2.2 Harris Lake

Although the original lake basin of Harris Lake is quite extensive, water levels in the lake have currently dropped to the point where there is only a small permanent deepwater area remaining.

Twenty-four (24) species were recorded from Harris Lake (Exhibit 16) of which 10 were deepwater species. Floristic quality is low, although marginally better than Lower Lake from Tier I and significantly better in Tier II because of the presence of more high quality submersed species (Table 4-6).

The identifiable aquatic plant beds consisted of a *Nymphaea odorata* (white water lily) band at the perimeter of the open water zone, then a wider *Nuphar advena* (spatterdock) zone followed by an intermixed zone of arrowhead (*Sagittaria*) and *Cyperus odoratus* (fragrant flatsedge) and on slightly drier ground a band of *Lythrum salcaria* (purple loosestrife) (Figure 25). *Typha latifolia* (common cattail) and *Pontederia cordata* (pickerelweed) were also present in isolated patches. The majority of the lake was unnavigable and not wadable, and consisted of an extensive stand of fragrant flatsedge interspersed with some spatterdock beds in deeper areas. The minimal extent of the open-water zone compared to the size of the lake basin is readily apparent in Figure 25. Like Lower Lake, the water in Harris Lake is very high in organic content and darkly colored making visibility minimal for submersed aquatic plant growth. The abundance of lemnids (duckweeds) also causes substantial shading.

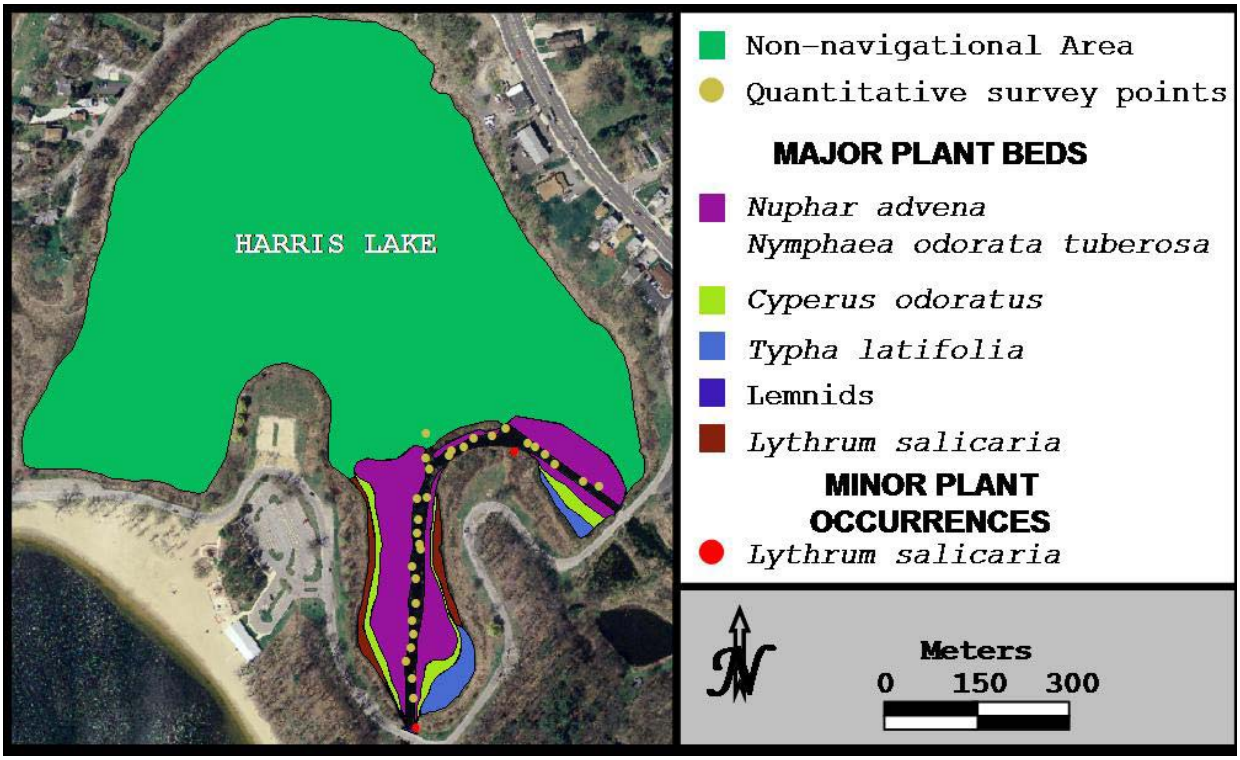

Figure 25. Aquatic Plant Communities in Harris Lake.

4.2.2.2.3 Clear Lake

Twenty-six (26) species of aquatic plants were found in Clear Lake. In their July 2004 fisheries survey, DNR biologists reported ten (10) species of aquatic plants in Clear Lake. The aquatic plant community in Clear Lake is dominated by *Myriophyllum spicatum* (Eurasian water-milfoil). This species was found at 94% of sites sampled, with a relative frequency of 41%, suggesting that it was often the only species or one of a few species found at each location. The density of this species (4.5 out of a possible 5.0 across all sites) likely contributes to the relatively low species diversity of submersed aquatic plants in Clear Lake. Clear Lake only has 12 submerged species compared with 24 for Stone Lake. The overall FQI value of 22.7 for Tier I and 12.0 for Tier II (see Tables 4-5 and 4-6) is very low and is rather low, less than half that of Pine or Stone Lakes.

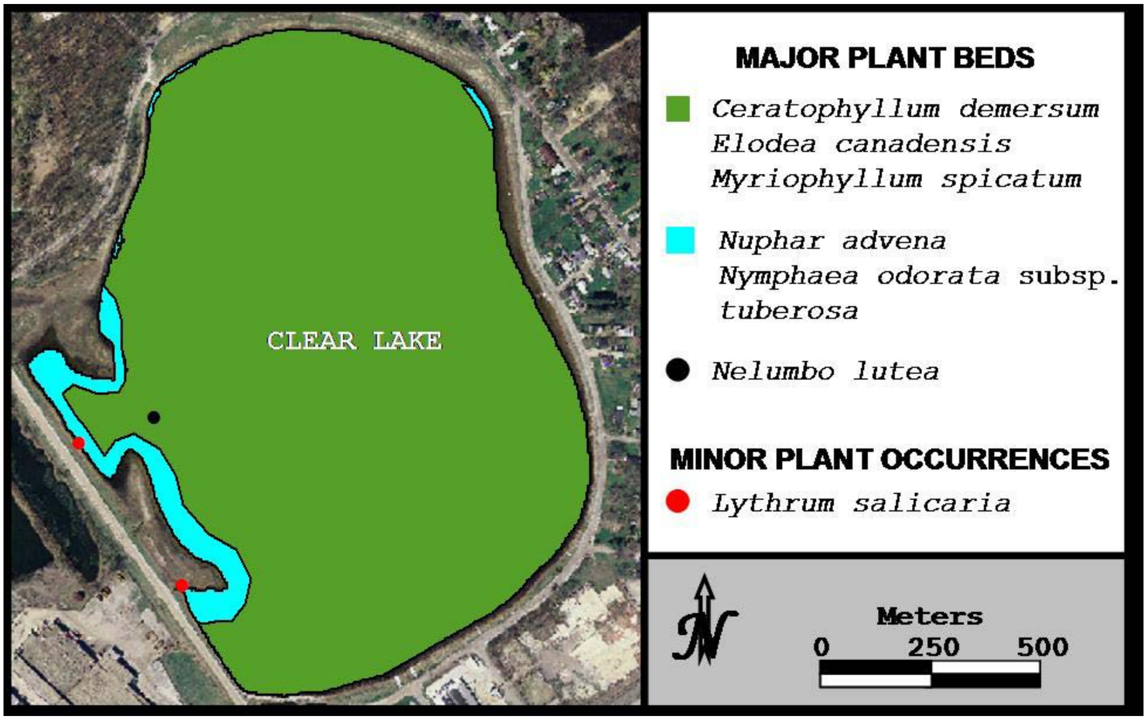

Figure 26. Aquatic Plant Communities in Clear Lake.

One bed of plants worthy of note on the lake is a small stand of *Nelumbo lutea* (water lotus) on the east side. This species is rare in the region and occurs sporadically throughout the state. The closest other population is an extensive stand along the eastern and western shores of Crane Lake in La Porte. Plants of this species form beautiful round, large unwettable leaves, often two feet across, with large showy yellow flowers and seed heads (often used in floral arrangements).

Other non-native species found in Clear Lake included small patches of *Lythrum salicaria* (purple loosestrife) and *Najas minor* (minor naiad). Although the frequency of 10 percent (Table 4-8) would suggest minimal coverage of the latter species, near the shorelines (where few sample points occurred) there were extensive dense, small, stands of this species. Purple loosestrife is sporadic along the shoreline but is not problematic in any area.

4.2.2.2.4 Lily Lake

Lily Lake had sixteen (16) species of aquatic plants recorded. This is down from the 49 species reported by Boklund (1988). There were very few submersed species, primarily because of its advanced eutrophic state. It had the lowest number of submersed species (six) recorded for any of the lakes studies, although only four were sampled during the

Tier II survey. It also had the lowest floristic quality of any lake. We attribute this to the lack of available light and carp activity.

The most visible and predominant species at Lily Lake is spatterdock which forms an extensive border around the perimeter of the lake (Figure 27). White water lilies were often on the deepwater side of the spatterdock. Spatterdock is especially abundant at the shallower southern end of the lake at the junction of Lake and Hawthorne Streets. *Typha latifolia* (common cattail) and *Cephalanthus occidentalis* (buttonbush) are also common in small stands on the west and east sides of the lake. Purple loosestrife occurs as a zone to the landward side of the spatterdock. On the northeast side there is little vegetation since the lake sits up against the road embankment of Pine Lake Avenue.

Although Eurasian water-milfoil is present in the lake, it only occurred at 18.5% of sites (a relative frequency of 17.2%), suggesting a relatively low frequency of occurrence and low density. This is verified by the density value of 1.8 (Table 4-8). *Najas minor* (minor naiad) had identical values for both frequency and slightly lower values for density (1.6, see Table 4-8).

As lakes undergo eutrophication, the aquatic plant populations disappear and the lakes become dominated by plankton. PNC biologists R. Scribailo and M. Alix have been surveying Lily Lake for over ten years and it has shown the worst decline in quality of any of the six lakes being studied here. Approximately ten years ago, Lily Lake had an extensive array of submersed aquatic plants, the most dominant of which was *Myriophyllum heterophyllum* (variable-leaved water-milfoil), a native and highly desirable species. There are now almost no submersed aquatic plants left in the lake since all of the available light for photosynthesis is gone in the first half meter. Continued input of pollutants and nutrients from the storm sewers off Pine Lake Avenue, carp roiling of the lake bottom, and other disturbances have presumably resulted in diminished light transmission and contributed to the lake's degraded plant communities.

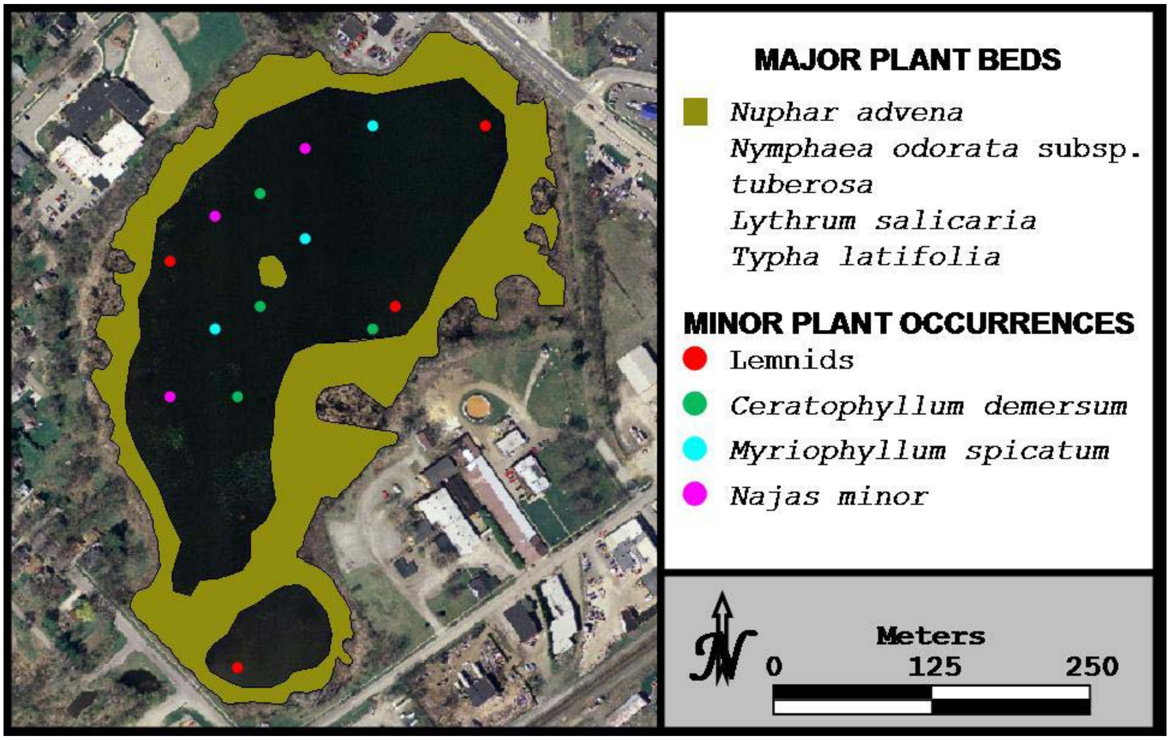

Figure 27. Aquatic Plant Communities in Lily Lake.

4.2.2.2.5 Stone Lake

Stone Lake had the second highest floristic quality of the lakes studied, ranking slightly behind Pine Lake for both Tier I and Tier II methods (Tables 4-5 and 4-6). It had the highest number of species recorded for both survey methods and these species tended to have much higher mean coefficients of conservatism (C) than those found at the other lakes. Stone Lake is largely protected from disturbance, being only extensively developed along one shoreline, and having no heavy high-speed boat traffic. Given its smaller size than Pine Lake (approximately one-third the acreage) and low occurrence of Eurasian water-milfoil (only a 7.1% frequency and 1.5% relative frequency; Table 4-7), Stone Lake can be considered as the most pristine of the six lakes studied, the lake having an aquatic plant community most similar to pre-European settlement conditions.

The aquatic plant community of Stone Lake has many desirable qualities, the most significant of which is high diversity throughout most of the lake. Thirty-four (34) species were found during our surveys. Particularly worthy of note is the presence of a number of state-listed rare or uncommon taxa. This includes *Bidens beckii* (water marigold), *Potamogeton praelongus* (white-stem pondweed), *Potamogeton freisii* (Fries pondweed), *Potamogeton strictifolius* (stiff pondweed), and *Potamogeton robbinsiiI* (Robbin's pondweed). Pondweeds are good indicators of habitat quality and Stone Lake, with 10 species, has the highest diversity of any of the lakes. In fact, this number of pondweed species is high for any lake in Indiana and ranks Stone Lake as one of Indiana's finest.

Stone Lake has a population of the macrophytic algae referred to as charophytes (*Nitella* and *Chara)* that are intermixed with other species. *Chara foliolosa* is an uncommon species in the state.

With the exception of emergent and floating-leaved species (Figure 28) it was not possible to accurately circumscribe distinct beds of submersed aquatic plants for Stone Lake. The map identifies areas that tended to have a greater abundance of certain species but these typically formed diffuse continuums into other beds of aquatic plants. Beds that had a predominance of Robbin's pondweed and its associated community are identified on the map.

There are several beds of spatterdock and white water lily around Stone Lake. There are also scattered patches along the shoreline in other locations. The west end of the lake, which is largely protected from wave energies, has an extensive wetland area with a nice stand of *Pontederia cordata* (pickerelweed). On the shore side there is an extensive patch of *Bidens cernua* (nodding beggars-ticks).

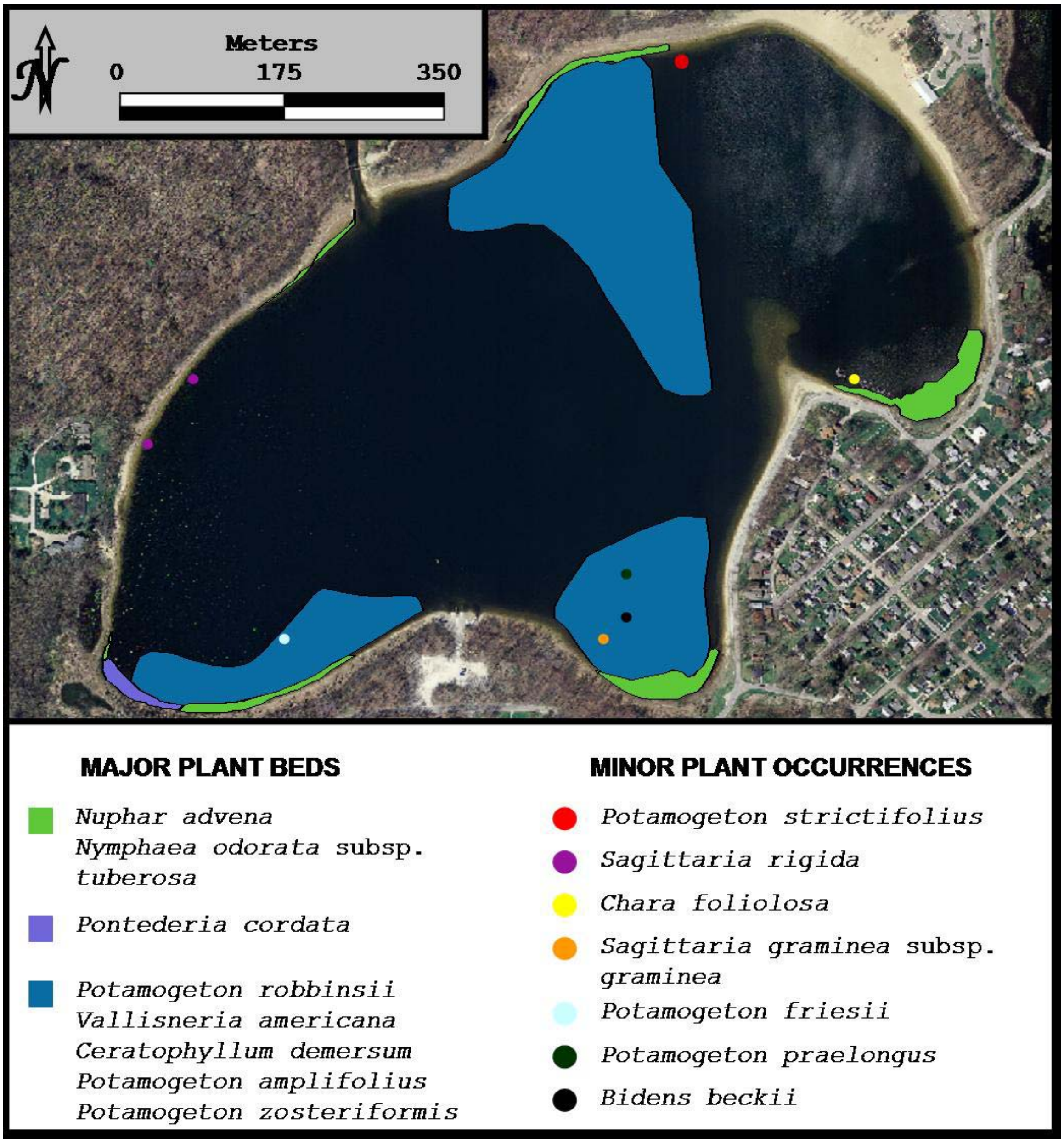

Figure 28. Aquatic Plant Communities in Stone Lake.

4.2.2.2.6 Pine Lake

The aquatic plant community in Pine Lake has characteristics very similar to Stone Lake. The lakes have similar species richness, as Pine Lake has thirty-nine (39) species, with many species of high conservatism. Twenty species of plants were recorded in a 2005 survey of Pine Lake (Aquatic Control 2006).

Pine Lake suffers from shoreline disturbance and boat-traffic moreso than the other lakes. Personal watercraft have damaged some near-shore aquatic plant communities. These issues are addressed in more detail in a subsequent section of this report.

Eurasian water-milfoil was found at 15% of the sites sampled in Pine Lake. At these sites its relative frequency was only 5% suggesting it was a subordinate part of the plant community (Table 4-7). The density of the species (1.1) also indicates low abundance even in locations where it was found (Table 4-8). There are some extensive beds of this species in the lake on the two shallow bays (Figure 29). In 2005 and 2006 there were targeted efforts to control Eurasian water-milfoil on the north side of Pine Lake.

No other submersed non-native species were found in Pine Lake during the survey, although *Potamogeton crispus* (curly-leaf pondweed) has been recorded from the lake from previous years. This species tends to predominate in spring so its absence in late summer is not surprising.

Noteworthy species of Pine Lake are the same as those for Stone Lake with the important addition of the state-endangered *Myriophyllum tenellum* (slender milfoil). This species is the only known record for Indiana and was discovered several years previous (Scribailo and Alix 2006). It forms substantial beds off of the point and on the northeast relatively undisturbed parts of the shore. It grows in shallow water up to about three feet deep and is very susceptible to damage from personal watercraft and low lake levels.

Although recorded from a survey from the previous year (Aquatic Control 2006) we did not find *Potamogeton richardsonii* (red-head pondweed or Richardson's pondweed) or *Myriophyllum verticillatum* (whorled water-milfoil) in Pine Lake.

Floating leaved and emergent beds of aquatic plants are uncommon on the lake due to shoreline development. There are some small patches of mixed spatterdock and white water lily on the lake with the largest occurring in shallow bays. Emergent stands of aquatic plants are found along most undeveloped shorelines especially along the northeast shore. Unfortunately, with lowered water levels many of these stands have given way to aggressive weedier species such as *Polygonum pennysylvanicum* wherever shoreline is exposed. There are several isolated stands of common cattail as well as common reed (*Phragmites communis*), the latter being a non-native invasive. Purple loosestrife also occurs on the lake but only in small areas.

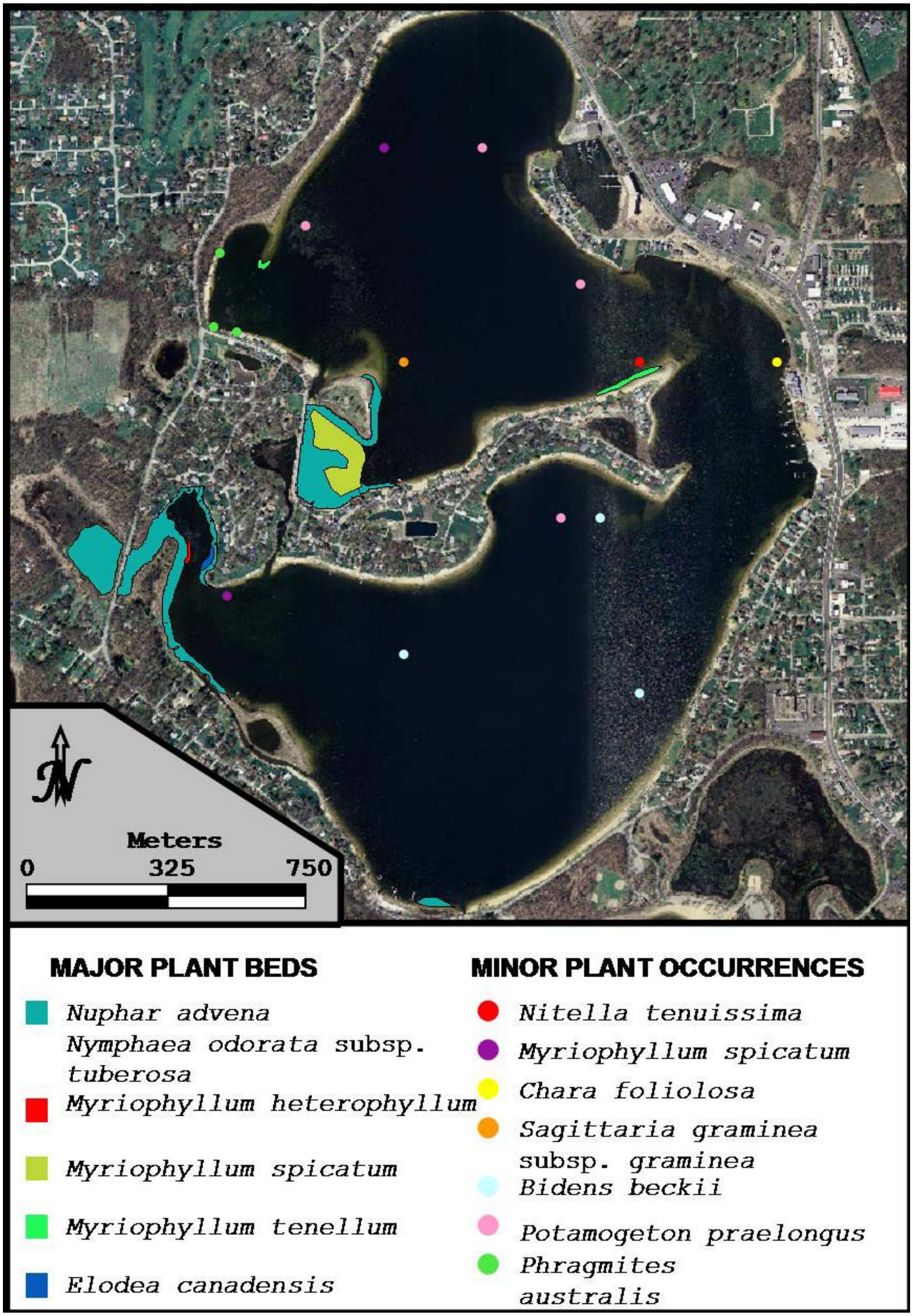

Figure 29. Aquatic Plant Communities of Pine Lake.

4.2.3 Fish Communities

The DNR Division of Fish and Wildlife provided copies of their fish management reports for Clear, Stone and Pine Lakes (IDNR 2000, 2004). These lakes have productive warmwater fisheries and are managed by the DNR to provide users with sunfish angling opportunities.

The DNR surveyed the fishery in Clear Lake in 1980 and again in 2004. Summary data are provided below (Table 4-10). The 1980 survey found 411 fish representing 13 species. Notably, the DNR recommended chemical control of submersed aquatic vegetation in the 1980 report. The 2004 survey used similar methods and caught 518 fish representing 14 species. More than 75% of the catch by number consisted of game species accounting for 67% by weight. In 1980 bluegill was the fifth most abundant species, but in 2004, bluegill was the most numerous fish in the sample. The DNR's report indicated that bluegill growth was average for northern Indiana lakes and that the proportional stock density indicated balance between bluegill growth and abundance. Redear, black crappie, largemouth bass, and yellow perch growth were below average. The DNR reported that …"excessive submersed vegetation was undoubtedly the main factor in this these poor growth rates and a contributor to occasional winterkills in Clear Lake. Despite the apparent use of a mechanical harvester, submersed vegetation was present in problem densities. Anglers often complain about the difficulty in fishing at the heavily weeded lake". There are some very large carp in Clear Lake; numerically only 1%, but carp was nearly 20% of the catch by weight. Redear sunfish (*Lepomis microlophus*), increased in numbers and weight between the 1980 and 2004 surveys. This may reflect the preference of the redear for submersed vegetation, or, a relative abundance of snails, its preferred food source. Bowfin (*Amia calva*) and white sucker (*Catostomus commersonii)* were not found in 2004, but we do not believe this reflects an adverse change to habitats in Clear Lake.

Pine and Stone Lakes were surveyed in 2000 (IDNR 2000). The DNR surveys these two lakes together, and combines the data on the grounds that they are connected by the channel under Waverly Road. Table 4-11 summarizes their survey findings. The DNR report contained no specific fisheries management recommendations, the result of excellent growth rates, abundances, and sizes of game fish in the lakes. Smallmouth bass was found in 2000 for the first time ever, an illegal introduction by anglers.

Table 4-10

NUMBERS AND WEIGHTS OF FISH IN CLEAR LAKE

(Source: Indiana DNR Division of Fish and Wildlife)

	2004		1980	
Species	**Num (%)**	**Wt (%)**	**Num (%)**	**Wt (%)**
Bluegill	30.9	14.5	7.3	2.1
Redear	16.0	9.7	1	0.1
Golden shiner	15.8	8.1	16.3	9.7
Yellow perch	14.5	3.3	21	6.4
Black crappie	7.9	2.3	21.2	9.4
Largemouth bass	7.5	23.4	12.4	6.8
Northern pike	1.5	14.5	-	-
Pumpkinseed	1.5	0.4	0.2	< 0.1
Carp	1.0	19.7	2	16.5
Lake chubsucker	1.0	1.2	9.8	4.5
Orange spotted sunfish	1.0	0.1	-	-
Brown bullhead	0.8	2.1	1.5	2.4
Warmouth	0.4	0.2	2.4	1
Yellow bullhead	0.2	0.6	-	-
Bowfin	-	-	4.4	37.9
White sucker	-	-	0.7	3.3
Totals	518 fish	138.67 lbs.	411 fish	136.57 lbs.

Table 4-11

NUMBERS AND WEIGHTS OF FISH IN PINE AND STONE LAKES

(Source: Indiana DNR Division of Fish and Wildlife)

Species	Number (%)	Weight (%)
Bluegill	41.6	11.6
Largemouth bass	21.8	45.1
Yellow perch	17.9	8.1
Redear sunfish	6.6	7.6
Warmouth	3.8	1.7
Smallmouth bass	1.6	3.5
Yellow bullhead	1.0	1.6
Brown bullhead	1.0	2.6
Bowfin	1.0	12.3
Brook silverside	0.8	<0.1
Lake chubsucker	0.7	0.1
Grass pickerel	0.7	0.3
Black crappie	0.5	0.5
Blacknose dace	0.3	<0.1
Walleye	0.2	1.0
Banded killifish	0.2	<0.1
Carp	0.2	4.0
Golden shiner	0.2	<0.1
Johnny darter	0.2	<0.1
Totals	610 fish	

4.2.4 Rare or Endangered Species

We consulted with the Department of Natural Resources' Natural Heritage Data Center to check records on the occurrences of threatened, endangered or special concern species and high-quality natural areas in the study area. Exhibit 18 provides the results of the query. The DNR Natural Heritage Data Center reported three species for the general area: least bittern (State endangered), badger (species being monitored), and spotted turtle

(State endangered). The study area is also in the range of Indiana bat (federally-listed endangered) and bald eagle (federal threatened).

Lily Lake, Pine Lake and Stone Lake have additional records of rare, endangered or threatened species. Lily Lake has records of one bird (black tern, State endangered), one snail (swamp Lymnea, species of special concern), two snakes (massasauga, State endangered and a federal candidate for listing, and smooth green snake, State endangered). Lily Lake also has records of three listed aquatic plants: *Potamogeton friesii* (Fries' pondweed, State threatened), *Potamogeton pusillus* (Slender pondweed, watch listed), and *Sparganium androcladum* (Branching bur-reed, State threatened). None of the three State-listed species were found in Lily Lake during our 2006 field surveys.

Pine Lake has records for one State endangered fish, lake sturgeon, *Acipenser fulvescens*, last recorded in 1992. Six wetland or aquatic plant species are on the list for Stone Lake. *Bidens beckii*, Beck water-marigold, is State threatened and was found during our 2006 surveys. *Carex atherodes*, awned sedge, is State endangered, last recorded in 1980, and not seen during our surveys. *Eleocharis melanocarpa*, commonly named black-fruited spike-rush, is a State-listed threatened wetland plant, likewise not seen during our surveys. *Juncus pelocarpus*, or brown-fruited rush, was not seen by our crew either. Two pondweeds are on the Natural Heritage Data Center listing as rare species. *Potamogeton robbinsii*, or flatleaf pondweed, and *Potamogeton strictifolius*, straight-leaf pondweed, were both recorded in Stone Lake, but only . *Potamogeton robbinsii* was found in Pine Lake during our 2006 surveys. *Myriophyllum tenellum*, not in the Natural Heritage Data Center's database, is state-endangered; *Myriophyllum tenellum* was found in this and in prior surveys. Also, *Potamogeton praelongus*, a State-listed threatened plant not on the Natural Heritage Data Center's database for Pine Lake was found in 2006.

Lastly, Stone Lake has no records for protected animals, but there are four plants on the list. Beck water-marigold, State threatened species, was also found during our field surveys. *Myriophyllum pinnatum*, or cutleaf water-milfoil, is State endangered, was last recorded from Stone Lake in 2000, but was not seen during our 2006 surveys. White-stem pondweed, *Potamogeton praelongus*, is a State-listed threatened plant, and was recorded during our 2006 surveys. The rare plant *Potamogeton robbinsii* (flatleaf pondweed) was also recorded in Stone Lake during our 2006 surveys.

4.3 Shoreline Erosion and Sedimentation

The natural kettle lakes in La Porte generally have low-gradient shorelines and are not particularly susceptible to erosion. The shorelines of Pine Lake and Stone Lake were surveyed to assess erosion and sedimentation conditions. Shoreline erosion problems on the lakes are primarily associated with the current low water levels. The low water levels have exposed large areas of lake-bottom along the shore. Wind and boat-generated waves dislodge and resuspend shoreline materials, eroding the beach. The sediment is deposited deeper in the lake below the level of wave action. These problems are pronounced on shorelines of lakes which are most subject to wave action because of the direction of prevailing winds, especially during storm seasons. In this region the strongest winds come from the northwest (Figure 30). The resultant wave energy is therefore generally greatest on the eastern shorelines of lakes.

Other general problems with exposed sediments are that they can be eroded by rainwater and runoff with sand being transported down the slope of the beach towards the center of the lake. On Pine Lake the activity of personal watercraft and powerboats has also eroded beach areas, creating channels in the beach where they are pulled onto shore. When these channels are exposed to wave action, the effect is much like gulley erosion where suspended particles take the path of least resistance through the channel and back into lake. Through this process, the trough continues to widen over time. Personal watercraft and powerboats on Pine Lake also cause excessive wake near shore that further degrades unconsolidated shorelines especially in times of low water levels.

An additional problem associated with low water levels involves the exposure of formerly submerged beach areas which are then invaded by weedy plant species. This is especially a concern where exotic species such as common reed (*Phragmites communis*) invade these areas. For example, such an invasion is occurring on the eastern and northern shores of Pine Lake and the eastern shore of Stone Lake.

There are several homeowner sites and commercial developments on Pine Lake where shoreline erosion has been caused by a lack of bank stabilization. Care must be taken that housing units being developed around the lake have proper erosion controls in place and that parking lot runoff and other drainage is properly managed before reaching the lake.

Bluff erosion behind the shoreline is an issue in a few locations on the lake where slopes are steep. The locations where this is problematic are on the northwest shores of both Pine and Stone Lakes. If these slopes are left natural and vegetated, little bluff slumping occurs. But, when trees are cleared and non-native grasses planted and mowed, the vegetation may not be sufficient to hold the banks together. Slumping of bluffs or slopes can also contribute added nutrient loads to the lakes.

Normally, well consolidated marshes prevent erosion and sedimentation by absorbing wave energies, binding sediments, and causing sediments to settle.

Sedimentation problems are not severe in La Porte's lakes. The channel connecting Stone and Pine Lakes has to be regularly maintained to support boat passage between the lakes. The Park Department dredges the channel every five to ten years. Sediment moving into the channel is likely wind-driven and derived from the eastern shore of Pine Lake, and locally eroded material. Banks along the channel are steep and continue to be undercut by the wave action of wind and boats. This problem has been exacerbated in the face of current low water levels. When lake levels were higher, a border of water lilies and other aquatic plants protected the shore from erosion. This border has become one of terrestrial weeds with the lowered water levels. Figure 30 overlays the local wind rose on Pine Lake. This graphic provides evidence that sediment is transported southwest along the lake's eastern shore. This material is deposited on the south shore, including in the channel to Stone Lake. Mean wind speeds, shown in pink, are fairly similar in all directions. The percent of time that the wind is blowing in a given direction (shown in pale blue) is predominately to the southwest. A jetty on Pine Lake's south shore just east of the channel may intercept some of this sediment. The shore to the east of the channel is used as a bathing beach, so shoreline stabilization is not practical without affecting public use of the area.

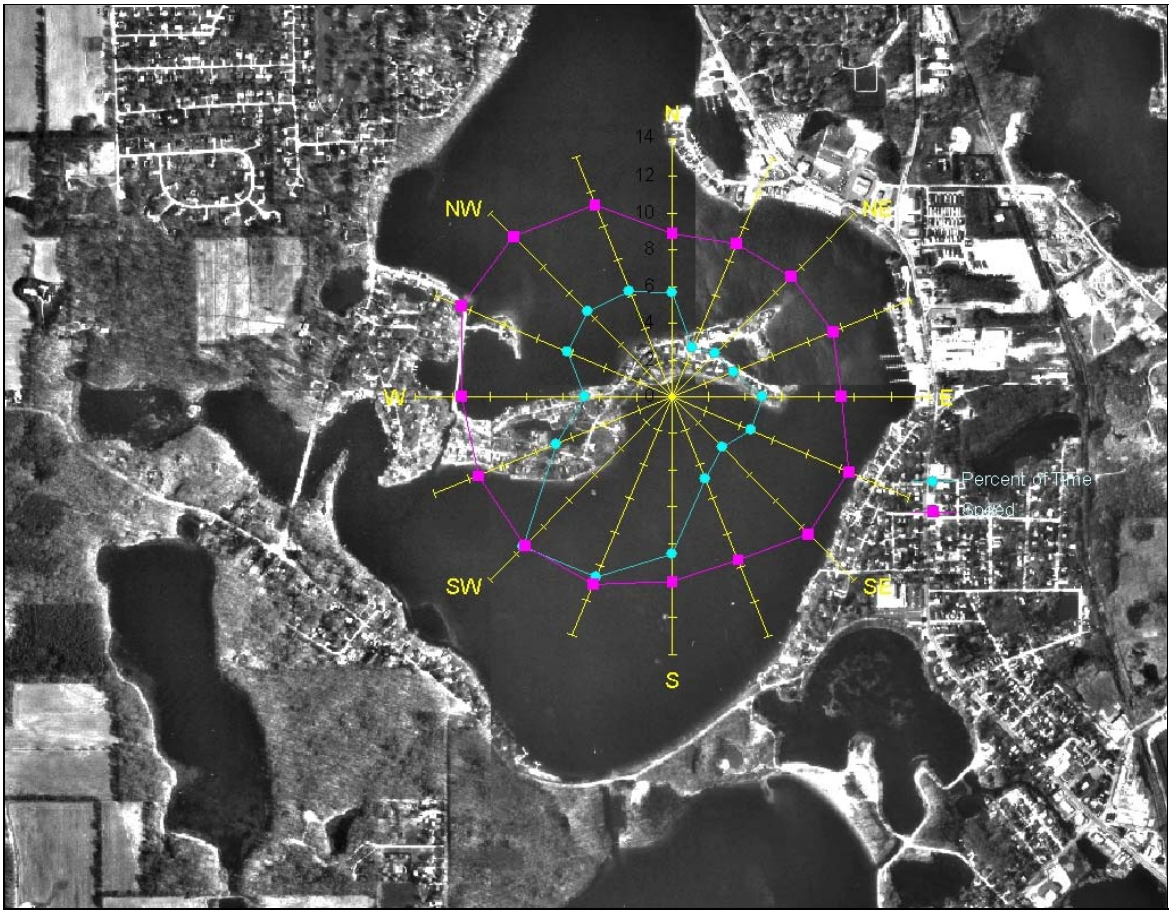

Figure 30. Overlay of Wind Rose and Pine Lake.

5.0 LAKE MANAGEMENT PLANNING

This chapter outlines management actions for each lake. Management recommendations involve aquatic plants, stormwater and water quality, shorelines and recreation for all or some of the six lakes evaluated. Water quality recommendations focus on phosphorus, the limiting nutrient in these lakes.

5.1 Clear Lake

Because of its prior LARE endeavors, we reviewed the City's management practices for this waterbody over the past decade. Vegetation harvesting, shoreline plantings, and stormwater treatment are ongoing practices in Clear Lake.

Clear Lake is adjacent to a large former industrial facility that is planned for redevelopment under the NewPorte Landing Project. We recommend that the City request IDEM to sample fish tissue and sediment in Clear Lake and test them for contaminants. Angling is popular in Clear Lake, and residents are exposed to contamination if they eat their catch. Sediment in Clear Lake and the two small ponds immediately west of Clear Lake should also be sampled and tested for contaminants.

5.1.1 Aquatic Plant Management

The non-native macrophyte Eurasian water-milfoil (*Myriophyllum spicatum*) dominates Clear Lake. The City has been operating an aquatic plant harvester on the lake for over a decade, based upon the recommendations of a prior LARE feasibility study (Harza 1990). Those recommendations were based in part upon the long-term nutrient removal benefits of harvesting. Records have unfortunately not been kept allowing for estimation of nutrient removal using the harvester. City staff has reported anecdotal comments from lake users lauding the harvesting program. Despite use of this equipment for over a decade, the extent and abundance of Eurasian water-milfoil appears to be the same, or possibly greater than, that present prior to the harvesting program. Whether this is due to insufficient harvesting effort, the invasive nature of Eurasian water-milfoil, continuing nutrient enrichment, or a combination of factors, the harvesting program is costly and appears to be less than effective for this species.

Lake use is affected by the Eurasian water-milfoil abundance. While boating is not particularly popular on Clear Lake as residents are accustomed to boating on the other nearby lakes where the water-milfoil is less likely to foul propellers, keels or oars. Fishing is certainly affected, but more experienced fishermen develop techniques and equipment to mitigate the water-milfoil's hook fouling propensities. Aesthetic qualities of Clear Lake are also affected by the macrophyte abundance, although we have not assessed user perspectives on this. Future residential development around the lake may alter types and levels of lake uses.

Aquatic plants provide cover and supporting habitats for fish and macroinvertebrates. The most recent DNR fish management report found that Clear Lake supports populations of bluegill, redear, black crappie and largemouth bass that provide good fishing opportunities (IDNR 2004). An occasional legal-size northern pike is also caught. However IDNR reported that the growths of redear, yellow perch, black crappie and largemouth bass are below average. The DNR believes that the abundance of submersed vegetation to be the main factor in this these poor growth rates and a contributor to occasional winterkills. They also recommended improved aquatic plant controls for Clear Lake.

Colonization of lakes by macrophytes is typically limited to a maximum depth permitted by the penetration of light. The depth of 1% light penetration (generally agreed to approximate the depth of photosynthetic activity), was measured in July by Purdue biologists to be 2.8 ft in Clear Lake. Survey data however clearly indicate water-milfoil has colonized much deeper waters. US EPA (1988) provided a criterion for estimating the maximum depth of macrophyte colonization (h) based upon Secchi disk depth (SD). The empirical relationship for Wisconsin is:

$$\log h = 0.79 \log SD + 0.25 \qquad \text{(Eq. 5)}$$

where h and SD are expressed in meters. If this regression can reasonably be extrapolated to La Porte County for approximating the depth of macrophyte colonization in Clear Lake, we would expect water-milfoil to grow in waters up to about 10 feet deep.

Two alternatives to rectify the Eurasian water-milfoil problem in Clear Lake include a whole-lake herbicide treatment or use of aquatic weevils. Localized herbicide treatments using a selective systemic herbicide (such as 2,4-D) will be effective as well, but only for the short to medium term (one to two years) (AERF 2005).

Aquatic weevils can be very effective at controlling Eurasian water-milfoil under the right circumstances (Waltz, White and Scribailo 1997; Scribailo and Alix 2003). The milfoil weevil, *Euhrychiopsis lecontei*, is highly specific to watermilfoil species and has been shown to control Eurasian water-milfoil via stem mining in laboratory, tank and mesocosm studies, as well as in several field studies. *Euhrychiopsis lecontei* is a native insect, highly specific to feeding on water-milfoil plants (Sheldon and Creed 1995, Solarz and Newman 1996). Several laboratory and field experiments have demonstrated that adult milfoil weevils prefer Eurasian water-milfoil for feeding and oviposition. Eurasian water-milfoil declines have been associated with the occurrence of herbivorous insects at numerous locations. Declines of Eurasian water-milfoil associated with these insect have been documented in several lakes in Vermont (Sheldon and Creed 1995), lakes in Ontario, Wisconsin, Minnesota and Illinois (Creed and Sheldon 1991, Creed 1998). These observations indicate that the herbivorous insect can control Eurasian water-milfoil. Relatively high densities (200-300 weevils per square meter, or approximately 1-3 weevils per stem) may be needed to effectively control Eurasian water-milfoil.

Factors that limit weevil density and abundance will affect the success of this technique. In his review of milfoil weevil use as a biocontrol, Newman (2004) reviewed critical life history and environmental factors for success with this technique. During the summer, all milfoil weevil life stages subsist on submersed water-milfoil. Adult weevils move to the lake shore to overwinter in leaf litter. The species prefers the exotic Eurasian water-milfoil as a food source over native water-milfoils. Declines of Eurasian water-milfoil due to weevil feeding should occur, but actual results have been mixed, particularly if weevil populations are too low. Predation by sunfish (*Lepomis* sp.) is undoubtedly an important factor that limits the densities of adult weevils. Other important factors for success involve adult reproductive lifespan and fecundity, and likely the presence of proper overwintering habitat (shoreline leaf litter).

It is not likely that the water-milfoil would be completely eradicated using this technique. An alternative to the use of milfoil weevils as a biocontrol is chemical control. Fluridone is a systemic herbicide that will kill the entire water-milfoil plant. Fluridone is generally non-selective and most submersed plants will be killed or affected by a whole-lake treatment. Fluridone manifests its effects by inhibiting the formation of carotene (a pigment) in growing plants. In the absence of carotene, chlorophyll is degraded by sunlight. This is a slow process and the contact time between the plant and chemical needs to be maintained for many weeks. Sonar® and Avast!® are two trade names for licensed aquatic herbicides containing fluridone as the active ingredient. Both liquid and slow-release granular formulations are now being used for whole-lake treatments.

Water-milfoil is particularly susceptible to fluridone and it is possible to achieve a complete eradication, not only of water-milfoil, but all aquatic macrophytes if the concentration used is higher than recommended solely for Eurasian water-milfoil.

Reinfestations are possible through the normal pathways (humans, birds). Germination by remnant seeds is considered rare.

Clear Lake can be considered a viable candidate for whole-lake fluridone treatment; it is heavily infested with Eurasian water-milfoil throughout the lake. Fluridone is not suitable for spot treatments since it is difficult to maintain enough contact time between the plant and the herbicide to kill the plant. The paucity of leaf litter along most of Clear Lake's shore does not bode well for good overwintering of the adult weevils, so we hesitate to recommend the biocontrol method.

A whole-lake herbicide treatment would warrant protection of the small colony of water lotus on the west side of Clear Lake prior to application (see Figure 26). There are no swimming, fishing, or drinking water restrictions when fluridone is in the lake, but the label warns against using the lake water for irrigation for seven to 30 days after treatment.

Fluridone needs to be applied correctly and with an experienced and licensed applicator to achieve the desired result. Maintaining a long contact time between fluridone and the macrophytes should not be problematic in Clear Lake due to the long hydraulic residence time and lack of an outlet. For complete eradication, a whole-lake fluridone concentration of 5 ppb should be maintained in the lake for approximately ten weeks during the spring and/or summer (Getsinger *et al*. 2001). Higher levels can damage native species, but unfortunately are typical, because herbicide applicators prefer to err on the side of overdose to make sure the treatment does not fail. Herbicidal symptoms appear in seven to ten days and appear as white (chlorotic) or pink growing points.

Treatment costs will vary based on lake surface area, water volume treated, and the number of treatments needed to maintain the target concentration for ten weeks.

There can be significant impacts to the lake during and following treatment. Fluridone is a non-selective herbicide, which means most submersed plants and some floating-leaved plants will be killed by fluridone during the treatment. Emergent species like cattails will be affected but should recover. Water lilies will appear bleached and cattails and other emergent species may look variegated.

While there is little or no direct toxicity of fluridone to animals when used according to the label, the loss of aquatic habitat does affect fish and macroinvertebrates. Smaller fish lose cover and larger predator fish can find them more easily. Waterfowl that eat vegetation tend to move to other vegetated waterbodies while waterfowl that eat fish may have improved fishing opportunities. Increased algal blooms are commonly associated with all herbicide treatments in the year of treatment.

Further, we recommend a long-term monitoring program be initiated by the City of La Porte to keep track of the abundance of Eurasian water-milfoil, not only on Clear Lake, but on other lakes within the city. A pre-emptive program like this has been carried out by many cities and lake associations throughout the United States.

LARE funding is available for control of exotic species like Eurasian water-milfoil, and several lakes have had success with this approach. Treatments of this type have been successfully carried out on a number of Indiana lakes.

5.1.2 Shoreline Vegetation

In 2006 the City planted native vegetation along the east shoreline of Clear Lake. We applaud this effort and encourage additional planting along the south shore. We also recommend that the City complete the plantings originally planned as part of the reconstruction of the sedimentation basin.

Native vegetation, aside from its environmental benefits, does not require mowing and can lower the City's annual maintenance costs. Canada goose can become a nuisance species in lawn areas that are in close proximity to water. Taller native vegetation discourages Canada goose populations from grazing and lounging there.

5.1.3 Stormwater Sedimentation Trap and Alum Treatment System

In 1990, Harza Engineering Company prepared an engineering feasibility study for Clear Lake. Sponsored by the LARE Program, this effort led to recommendations for aquatic plant and sediment management. A stormwater alum dosing system was installed at the south corner of Clear Lake, and an existing sediment trap there was rebuilt. This project was funded by a matching grant from LARE.

The sedimentation basin was rebuilt in 1999 and the alum dosing station went into operation in mid-2000. Contract documents specified the sedimentation basin to be cleaned of accumulated sediment to a minimum elevation of 793.0 ft (Harza 1995). We were unable to confirm that this dredging was performed. Baetis surveyed the accumulation of soft sediment in the trap in May 2006 and found 261 yd^3 to be present (Figure 31). An abundance of capacity remains in the basin and we do not recommend dredging at this time.

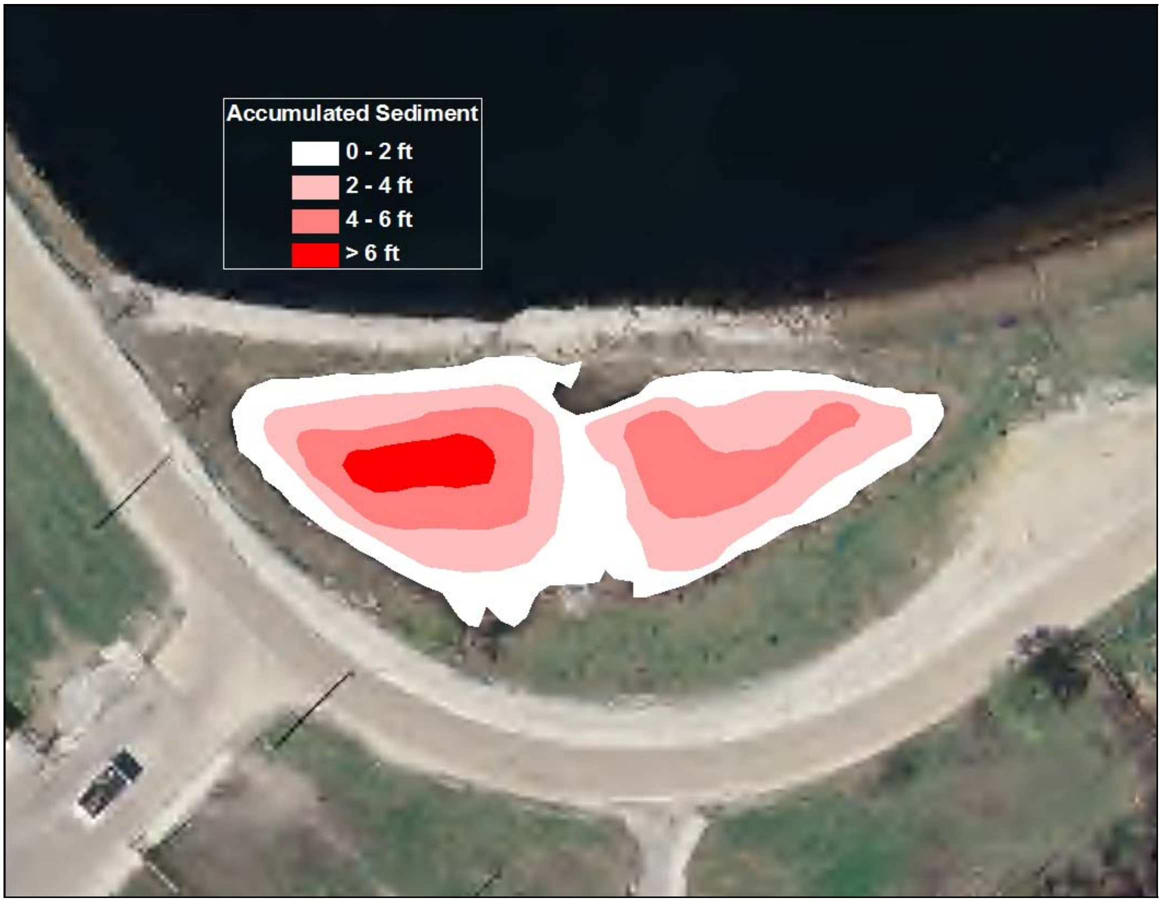

Figure 31. Depths of Sediment Accumulation in the Sedimentation Basin.

Operation and maintenance records for the stormwater alum dosing station from selected years were made available for this study by the City (Appendix G). The alum station was brought online in mid-summer 2000. Table 5-1 provides the annual amounts of alum used to treat stormwater conveyed to Clear Lake through the 42-inch RCP.

Table 5-1

ALUM USAGE AND STORMWATER VOLUME AT CLEAR LAKE

(Source: City of La Porte Wastewater Department Records)

Year	Alum Supplied (gal)	Stormwater (gal)
2000	1,918	12,230,000
2001	1,962	27,610,000
2002	2,266	27,510,000
2003	2,917	28,130,000
2004	2,190	39,360,000
2005	0	94,990,000
2006	580	20,500,000

The dosing rate should be fairly constant for a given volume of stormwater. Based upon the City's alum usage records, there is clearly a wide range of dosages at the station. Maintenance records indicate that the pump drive and flow meter have had recurring problems, and are responsible for the lack of operation in 2005 and part of 2006. Currently the station is not in operation as the flow meter needs to be replaced.

Surveying the sedimentation basin and review of the alum station operation brings up two issues.

1. The sedimentation basin was designed and constructed during a time when the lakes were at record high elevations. In fact, water was so high that Clear Lake Boulevard was closed to traffic. The sedimentation basin dam has an invert elevation well above current lake level. As a result, stormwater therefore largely filters through the dam prior to entering Clear Lake. Alum treatment is not necessary to remove suspended solids and associated pollutants from stormwater as long as the elevation of Clear Lake remains well below the level of the dam.

2. During the survey of the accumulated soft sediment in the basin, the field crew did not observe the characteristic "grayish-white" bottom material commonly associated with alum treatment areas. Further, the material was black, odorous, and large quantities of gases were released during the survey of the soft material. This suggests that insufficient alum is being used, and, that wastewater sewers

may be illicitly connected upstream or somehow contaminating the stormwater. We understand that subsequent to our survey, an illicit connection was uncovered upstream and corrected.

The second point, that insufficient alum is being used, would appear valid. ERD, the design engineer, estimated mean annual alum use to be 8,580 gallons. They also estimated mean annual alum deposition to be 4.7 inches, which is clearly not occurring (ERD 1995).

5.1.4 Pollutant Loadings

At this time, stormwater loads to Clear Lake beyond the 42-inch RCP at the alum station and sedimentation basin are relatively small. We have no recommendations for additional nonpoint source pollution control structures. Lakeside residents should be mailed any educational materials on stormwater and lawn care BMPs developed in the next stage. The NewPorte Landing Project may significantly alter drainage patterns and pollutant loads to Clear Lake. Currently plans for that redevelopment are conceptual and not sufficiently detailed to estimate its impacts to water quality; nevertheless, recommendations for stormwater management, at the conceptual level, are provided in Chapter 6.

5.2 Lower Lake

Lower Lake is bordered on one side by the 9.4-acre Lindewald Park and the other side by residential properties. It is essentially a scenic and wildlife resource, an herbaceous emergent wetland. Water depths are shallow even during wet years and without significant deepening, a fishery will not develop in Lower Lake. The surface of Lower Lake is predominately spatterdock with some intermixed patches of white water lily. No non-native species were found in our field survey. Spatterdock, although native, has a tendency to dominate the vegetative communities of similar shallow, organic bottomed habitats. Spatterdock is, in fact, the worst native invasive species in Indiana lakes, and the worst-case situation is on Lower Lake (ninety percent covered by spatterdock). There are a wide variety of systemic herbicide control options for spatterdock. Spatterdock is hard to control with herbicide without doing extensive damage to the ecology of the lakes. Mechanical removal with a winch system is another possibility. Increasing water levels to the lakes would ameliorate much of this problem, but is not a simple or inexpensive matter.

Lindewald Park abuts Lower Lake. The upland portion of the park contains a grove of white oak. The park is a popular site for family reunions and picnics. Facilities include picnic shelters, play ground, restrooms, ball diamond, volleyball courts and twelve lighted horseshoe pits. A boardwalk and environmental education kiosk would be compatible with the current use of City Park and highlight the interesting facets of Lower Lake. Lakeside residents should be mailed any educational materials on stormwater and lawn care BMPs developed in the next stage.

5.3 Pine Lake

Pine Lake is the largest of the lakes studied. The shoreline is mostly residential and recreation properties, although marina and related businesses are present along a stretch of Pine Lake Avenue that approaches the lake on the northeast shore.

Pine Lake is the largest of La Porte's lakes and receives the greatest recreational use. We recommend that the City request IDEM to sample fish tissue and sediment in Pine Lake and test them for contaminants. There is no data currently available on contaminants in Pine Lake. Given the popularity of fishing, and the potential dietary exposure of residents to contaminants, the fish tissue and sediment should be tested.

5.3.1 Aquatic Plant Management

Pine Lake has a limited Eurasian water-milfoil (*Myriophyllum spicatum*) problem. This invasive plant is restricted to a few shallow bays. The limited extent of this species may, in part, be due to herbicide treatments in 2005 although even before this the lake appears to have had little problem with this species (Aquatic Control 2005). The aquatic vegetation management plan report for Pine Lake by Aquatic Control indicated several areas of Eurasian water-milfoil (referred to by Aquatic Control as beds # 3, 4, 5, and 8). The concern was more one of homeowner access to the lake through beds of this species than a true aggressive problem with the invasive spread of this species. On July 21, 2005 a herbicide treatment of problem areas of Eurasian water-milfoil was carried out by Aquatic Control and this reduced the extent of this species in their late summer survey.

When Eurasian water-milfoil is limited to patches within the littoral zone, as it is in Pine Lake, selective herbicides such as 2,4-D or triclopyr are more effective treatment methods than fluridone. 2,4-D is suitable for spot treatment because it is a fast-acting herbicide that only needs a 48-hour contact time with the plant. Granular formulations of 2,4-D are generally less effective in killing all water-milfoil plants than the liquid formulation. Because some plants remain alive and scattered throughout the littoral zone after 2,4-D treatment with the granular product, hand pulling after treatment may be effective. Lake residents must be willing to follow-up spot herbicide treatments to ensure continued milfoil eradication.

We did not identify any location having even a moderate density of Eurasian water-milfoil which indicates that the herbicide application from the previous year was successful. Nevertheless, it is important that the extent of this aggressive non-native species be constantly monitored and kept to a low density. Further herbicide application treatment may need to be considered if the density or extent of this species increases.

As mentioned earlier, a long-term monitoring program could be initiated by the City of La Porte or other local stakeholder groups to map the extent of Eurasian water-milfoil on the City's lakes.

Two other exotic plants colonize localized shoreline areas around Pine Lake. Plans should be formulated to control of emergent exotic plant species around the lakes. Common reed, or phragmites, and purple loosestrife in particular are present at Pine Lake, and should be monitored and controlled. A variety of control methods could be employed to halt the spread of these and other emergent exotic species. Populations of common reed are small enough that hand-pulling could be used to remove much of this species on the lakes. Localized spraying with imazapyr (marketed under the trade names Chopper®, Arsenal®, Assault®) is a new environmentally safe way to effectively treat phragmites. The traditional method is to spray with Rodeo. Control actions may be needed over multiple years for effective control of phragmites colonies. Purple loosestrife can also be controlled with this herbicide. An alternative biological control method for purple loosestrife would be to use *Galerucella* beetles. A number of schools in the region have been involved in propagating beetles as school projects for release on purple loosestrife populations. Since the beetles are not very mobile they have to be placed on separate patches even if only a short distance from each other. Hand-pulling is also very effective with this species for small patches. It is important for both species that plants be cut prior to flowering each year to prevent further seed-set. With many of the populations of both species, increasing water levels would likely inundate the plants and kill them.

Aside from control of invasive species, we also recommend conserving of rare species, one of which is very special in Pine Lake. The state-endangered species, slender water-milfoil (*Myriophyllum tenellum*), inhabits Pine Lake and efforts to protect its habitat should be encouraged. The shoreline colonized by this plant has been affected by the currently low water levels. A small remnant shoreline population exists on the north tip of the point of the island. Personal watercraft activity in shallow water and beaching on-shore has gouged trenches in the sediment which are destroying the plant community. Bouys or markers, or signage could discourage this behavior. Sectors of the shoreline could be designated as off-limits to the breaching of boats. A no-wake zone should be established on Pine Lake to protect littoral zone plant communities form excessive wave action. Many lakes in the state have regulations of this type to protect shallow-water and shoreline plant communities.

5.3.2 Water Quality Management

There are commercial, residential and transportation interests abutting Pine Lake, each with potential for causing water quality degradation. The marinas should maintain their pumpout and refueling facilities so that accidental (or deliberate) releases of human waste, hydrocarbons or cleaning agents are not discharged to the lake.

Lakeside residents should be mailed any educational materials on stormwater and lawn care BMPs developed in the next stage.

The City, county and state road and highway departments should comply with erosion control ordinances when performing all improvements, including ditch cleaning. Mowing between the lake and Waverly Road could be discontinued in areas if the City replanted the roadside with native vegetation (and residents were satisfied with a naturalized shoreline). Any new drainage facilities installed should include structures to minimize sediment and associated pollutant loads to the lake. Winter deicing activities on lakeside roads should be performed at the minimal application rates necessary to achieve a safe roadway.

Pine and Stone Lakes have significant agricultural activities in their watersheds. Fertilizers, pesticides, herbicides, and sediment are common pollutants from these lands, particularly row crops like corn and soybeans. The SWCD is well positioned to work with farmers to implement agricultural BMPs to control these pollutants. Grants are available to assist landowners as well (see Section 5.7).

5.4 Stone Lake

Stone Lake is one of the finest lakes in the state. Stone and Pine Lakes should be managed to protect these fine resources from adverse shoreline development, further invasion by exotic species, and minimizing shoreline erosion when lake levels are abnormally high or low. Stone Lake is a high quality natural and recreational resource and warrants strong protection measures to maintain its water quality and biotic communities:

- Much of the shoreline is preserved (park property) and its terrestrial habitats should be properly managed
- Water quality in the lake is good to excellent and well worth protecting
- Aquatic plant community quality is excellent
- A variety of recreational facilities are available for public use

5.4.1 Aquatic Plant Management

Stone Lake has a high diversity of aquatic plants. There are limited amounts of Eurasian water-milfoil. These factors make it one of the finest lakes in the State. Spot herbicide application could be used to reduce the extent of the latter species off the exposed sandy point on the east side of the lake. Every two to four years, the City should monitor the extent of the Eurasian water-milfoil and curly-leaf pondweed (*Potamogeton crispus*) to make sure it is not spreading. Since all of the sample points from this study are geo-referenced, efforts could also be made while assessing the status of non-native species, to sample at a subset of points to determine if the composition of the plant community is changing.

5.4.2 Water Quality Management

There are commercial, recreational and transportation interests abutting Stone Lake. These lands offer their own potential for causing lake degradation. Lakeside residents should be mailed any educational materials on stormwater and lawn care BMPs developed in the next stage.

The City, county and state road and highway departments should comply with erosion control ordinances when performing all improvements, including ditch cleaning. Mowing between the lake and Lake Shore Drive, Grangemouth and other streets adjacent to lakes could be reduced or discontinued if the City replanted the roadside with native vegetation. Any new drainage facilities installed should include structures to minimize sediment and associated pollutant loads to the lake. Winter deicing activities on lakeside roads should be performed at the minimal application rates necessary to achieve a safe roadway.

Stone Lake has a portion of its watershed in agricultural use. Fertilizers, pesticides, herbicides, and sediment are common pollutants from row crops fields. The SWCD can offer farmers technical assistance to implement agricultural BMPs to control these pollutants. Grants are available as well (see Section 5.7).

5.4.3 Beach Management

The new beach on Stone Lake has the highest public use and the highest closure rate of all the beaches in La Porte. Swimming is known to contaminate water, as are birds (gulls, waterfowl), and without further investigation, contamination by sewage cannot be dismissed. Weather also affects measured coliform concentrations at beaches. If birds are the cause, and mounting evidence from around the country indicates this is commonly the case at many beaches, the beach closing rate can be reduced by affecting bird use of the beach. One method for doing this is to increase human presence on beaches through recreational programming: sports, instructional classes on the beach, fishing, etc.

5.5 Harris Lake

Harris Lake has no problems with non-native submerged aquatic plants. We do recommend efforts to eradicate the emergent purple loosestrife (*Lythrum salicaria*) around the lake by methods discussed in previous sections.

The proximity of Harris Lake to the Stone Lake beach facilities, Cummings Lodge, and the Park Department offices make it ideal for a wetlands education exhibit. Bird viewing platforms, boardwalks, and/or information displays, as discussed earlier for Lower Lake, could be part of an integrated environmental education program. The City could solicit for a corporation or not-for-profit group to sponsor the facility.

5.6 Lily Lake

Lily Lake is in the latter stages of eutrophication and filling because of excessive aquatic plant growth and sedimentation. The sources of sediment and associated nutrients and other pollutants is nonpoint source runoff, much of it from the commercial areas east of Pine Lake Avenue. Management priorities for Lily Lake should focus on reducing further degradation from stormwater runoff from commercial, transportation and residential properties. Future City investments in stormwater BMPs and the NewPorte Landing Redevelopment Project could be applied to reduce pollutant loads to Lily Lake. The LARE Program could be approached for technical and financial assistance associated with an engineering feasibility study of potential solutions to stormwater pollutant loads from the shopping center on Pine Lake Avenue; construction efforts might be eligible for LARE or Section 319 grant funding.

Lily Lake has no data on contaminant ecology. We recommend that the City request IDEM to sample fish tissue and sediment in Lily Lake and test them for contaminants. Given the use of the use for stormwater management from former industrial properties and current commercial and transportation interests, the fish tissue and sediment should be tested.

Dredging could deepen the lake and remove the accumulated sediments. In terms of the logistics of this process, the lake has the advantage that there are a number of access points for sediment removal, and the material could potentially be used to restore nearby former industrial lands owned by Allis Chalmers and others. LARE funds can be applied for this kind of project. Dredging is costly, ranging from \$4 to \$10 per yd^3 removed.

Spatterdock beds on the west side of the lake have thrived under the current low lake levels. These beds could be reduced by physical means, or with a wide variety of systemic or contact herbicides, to increase the diversity of the aquatic plant community.

Carp are further degrading Lily Lake and its vegetation community. This exotic species roils in the sediment to feed, uprooting plants, dislodging invertebrates and increasing turbidity and suspended solids levels in the water column. Carp removal would undoubtedly improve this lake, aid in restoring vegetation communities and improve water quality.

5.7 Funding Sources

There are numerous grant programs to support the City's ongoing environmental stewardship. Most require a local cost-share either in cash or in-kind services.

5.7.1 Lake and River Enhancement Program

LARE grants are available on a competitive basis for several actions that can address the ecology and management of public lakes and their watersheds. The LARE program is detailed on their website (http://www.in.gov/dnr/fishwild/lare/). All grants require a local cost share.

LARE grants are available for any of the following "traditional" efforts:

- Preliminary lake studies
- Lake or watershed diagnostic studies, such as this endeavor
- Engineering feasibility studies of pollution control measures
- Design engineering of control measures
- Construction
- Lake management plans
- Performance appraisals of a constructed pollution control measure

The deadline to submit applications for these "traditional" projects is January 31. Grants for approved projects will be awarded in the month of July each year.

Additionally, LARE sets aside one-third of its annual funds for sediment removal or exotic species control. Having an aquatic plant management plan is a prerequisite to acquisition of LARE funds for plant control. The deadline to submit exotic plant-related applications is December 31, with final awards the following March.

5.7.2 Section 319

Section 319(h) of the Clean Water Act provides funding for various types of projects that work to reduce nonpoint source water pollution. All states receive funding for nonpoint source pollution control under Section 319. In Indiana, IDEM administers these funds; their website (http://www.in.gov/idem/resources/grants_loans/319h/) describes the program. Section 319 funds are used to conduct assessments, develop and implement TMDLs (Total Maximum Daily Loads), and watershed management plans, provide technical assistance, demonstrate new technology, and provide education and outreach on pollution prevention. Organizations eligible for funding include nonprofit organizations, universities, and local, State or Federal government agencies. A 40% (non-federal) in-kind or cash match of the total project cost must be provided. LARE grants can be used as the match.

In Indiana, as in most states, the majority of Section 319(h) funds are being directed for TMDL development and implementation. The study lakes are not considered impaired [303(d)-listed] water bodies, and as such, may not be good candidates for receiving 319 grant funds. However, pairing one or more of the lakes with potential pollutant reductions in downstream impaired waterbodies would increase eligibility for 319 funding.

5.7.3 Section 205(j) Grants

These grants are funded under Section 205 of the Clean Water Act. The grants are for water quality management planning, and are used to determine the nature, extent and causes of point and nonpoint source pollution problems, and to develop plans to resolve these problems. No local match is required. Municipal governments, county governments, regional planning commissions, and other public organizations are eligible. Additional information on Section 205 is available on IDEM's website (http://www.IN.gov/idem/resources/grants_loans/205j/).

5.7.4 Agricultural Programs

There are several federally-funded programs for soil and water conservation in agricultural watersheds, including the Conservation Reserve Program (CRP), Wetlands Reserve Program (WRP), and Environmental Quality Incentive Program (EQIP). These programs can assist in managing water quality in parts of Pine Lake and Stone Lake watersheds.

CRP is a voluntary program encouraging landowners for long-term conservation of soils, water, and wildlife resources. CRP is the USDA's single largest environmental improvement program. It is administered through the Farm Service Agency (FSA) and involves 10 to 15 year contracts. Further information is available online at http://www.agr.state.il.us/Environment/conserv/index.html.

The WRP is also a voluntary program (http://www.nrcs.usda.gov/programs/wrp/). WRP also provides technical and financial assistance to eligible landowners to restore, enhance, and protect wetlands. At least 70 percent of each project area will be restored to the original natural condition, to the extent practicable. Landowners enroll eligible lands through permanent easements, 30-year easements, or restoration cost-share agreements. The program is offered on a continuous sign-up basis and is available nationwide. It is administered through the NRCS.

The Environmental Quality Incentive Program (EQIP) is another voluntary USDA conservation program for farmers faced with serious threats to soil, water, and related natural resources (general information at http://www.nrcs.usda.gov/PROGRAMS/EQIP/; Illinois information and materials at http://www.il.nrcs.usda.gov/programs/eqip/). EQIP provides technical, financial, and educational assistance primarily in designated "priority areas". Landowners, in consultation with a local NRCS representative or technical service provider, are responsible for development of a site-specific conservation plan, including nutrient management planning.

The Wildlife Habitat Incentives Program (WHIP) (materials available online at http://www.il.nrcs.usda.gov/programs/whip/index.html), is a NRCS program for developing and improving wildlife habitat, primarily on private lands. It provides both technical assistance and cost-share payments to help establish and improve fish and wildlife habitat.

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6.0 SUMMARY AND RECOMMENDATIONS

6.1 Diagnostic Summary

Urban lakes are important recreation and environmental resources and can present challenges for protecting their ability to support these uses. This project was a rigorous diagnostic study of six lakes in the City of La Porte. This chapter summarizes the diagnoses and lake management recommendations.

The six study lakes are kettles atop the Valparaiso Moraine. The lakes have no natural outlet; an artificial outlet, a siphon, was installed in the late 1990s after an extended period of high water levels. Now, the lakes are in an extended period of low water levels. Both the high and the low water levels in the lakes are the result of natural causes. The lakes have small watersheds relative to their sizes and volumes, and no natural outlet, and, when combined with extended hydrologic patterns, result in varying lake levels that require years to return to "normal". The difference between the high lake levels and the low lake levels has historically been as much as 11 feet. Understandably, this can cause difficulties for communities and infrastructure around these lakes. Current low lake levels are the result of an extended drought in La Porte County; the area is more than one year behind in precipitation. Fluctuating water levels are natural phenomena in the La Porte lakes and wetlands systems, and over time, these fluctuations serve to diversify their habitats and vegetation communities. Oscillatory water level fluctuations promote the interaction of aquatic and terrestrial systems, resulting in higher quality habitat and increased productivity. When the fluctuations in water levels are reduced through stabilization, shifting of vegetation types decreases, more stable plant communities develop, and species diversity and habitat value decrease (Wilcox and Meeker 1991).

The Indiana Trophic State Indices for five of the six study lakes are repeated in Table 6-1. Under the ITSI system, Harris and Lily are Class II, mesotrophic lakes and Clear, Pine and Stone are Class I oligotrophic lakes. Clear Lake, and perhaps Lily and Pine Lakes, seem to have ITSI values decreasing (improving) over time. These ratings allow ranking of the lakes for management purposes. Harris and Lily Lake are clearly the most eutrophic, and management measures should be directed at restoration and conservation of remaining high-value features. Stone and Pine Lakes are the least eutrophic, but have populations of the exotic filter feeding zebra mussel, so trophic state classification based on plankton metrics can be misleading. Management measures for Pine and Stone Lakes should focus on protection of the resource from degradation. Clear Lake, according to the ITSI, is the least eutrophic among the study lakes; however, all trophic indictors are not consistent. The ITSI does not include a metric for aquatic macrophytes, which are highly productive in Clear Lake, are not native to North America, and have adversely affected use of this lake.

Table 6-1

INDIANA TROPHIC STATE INDICES

Name	1972-79	1980-88	1989	1994-96	1999	2006
Clear Lake	30	26	22	9	7	12
Lily Lake	55			20	11	27
Pine Lake	22	30		21	5	17
Stone Lake	6	25		19	18	14
Harris Lake						26

Clear Lake has nuisance invasion of the exotic plant Eurasian water-milfoil. This plant covers 100% of the lake and outcompetes native plants for light, nutrients and space, and warrants control or even eradication. The DNR has repeatedly reported that control of Eurasian water-milfoil would improve the poor growth rates of panfish and reduce one contributor to winterkills in Clear Lake.

Due largely to the low water levels in the lakes in recent years, the native plant spatterdock has overgrown large areas in Lily and Lower Lakes, and to a lesser extent in Harris Lake.

The aquatic plant communities of Pine and Stone Lakes are diverse and healthy. Some Eurasian water-milfoil is present, and residents must vigilantly monitor it, keep it under control, and not spread it beyond its current distribution.

6.2 Lake and Watershed Management Recommendations

Below we present some general, or watershed-based, recommendations for protecting water quality in La Porte. These are followed by more specific recommendations for one or more of the study lakes.

6.2.1 Watershed Management Recommendations

The City of La Porte is not growing significantly, but tracts of former industrial properties are planned for redevelopment (NewPorte Landing). Below we present some recommendations for low-impact, or sustainable, development there. Also, management of existing properties affects runoff quality and quantity, and some recommendations for landscape management are also presented.

6.2.1.1 New Developments

Principals of sustainable design mimic predevelopment site hydrology by using site design techniques that store, infiltrate, evaporate, and detain runoff. Such techniques help to reduce off-site runoff, promote groundwater recharge, and in La Porte, refill lakes with clean water. There is a wide array of site design techniques that allow the planner to create stormwater control mechanisms that function in a manner similar to that of natural control mechanisms. If such techniques can be used for a particular site, the net result will be to more closely mimic the watershed's natural hydrologic functions or the water balance between runoff, infiltration, storage, groundwater recharge, and evapotranspiration. With the sustainable development approach, receiving waters may experience fewer negative impacts in the volume, frequency, and quality of runoff, so as to maintain base flows and more closely approximate natural runoff conditions. Some of the main goals and principles of sustainable development are to (PGC 1999):

- Provide an improved technology for environmental protection of receiving waters
- Provide economic incentives that encourage environmentally sensitive development
- Develop the full potential of environmentally sensitive site planning and design
- Encourage public education and participation in environmental protection
- Help build communities based on environmental stewardship
- Reduce construction and maintenance costs of the stormwater infrastructure
- Introduce new concepts, technologies, and objectives for stormwater management such as micromanagement and multifunctional landscape features (bioretention areas, swales, and conservation areas); mimic or replicate hydrologic functions; and restore/maintain the ecological/biological integrity of receiving streams.

Some communities around the country have begun to incorporate these principals into their development codes. We recommend that the City of La Porte and the New Porte

Landing planners consider these ideas, as they will be critical to preventing Clear Lake from approaching the eutrophic condition that Lily Lake as already become.

Site hydrology evaluation and understanding are required to create a hydrologically functional landscape. Urbanization and increased impervious areas greatly alter predevelopment hydrology. Large scale redevelopment projects, such as NewPorte Landing, not only present opportunities to reverse historic damage to hydrology and to remediate industrial pollution, but to initiate bold introductions of sustainable developments that improve the quality of life in the city.

Spatial organization of the development site is important to control runoff hydraulics. Unlike piped drainage systems that route stormwater underground and may function independently of surface topography, an open drainage system can work with natural landforms and land uses to become a major design feature of a site plan. The sustainable approach to stormwater management integrates urban forms with natural features of the site. Not only does the integrated site plan complement the land, but it can also save on development costs by minimizing earthwork and construction of expensive drainage structures.

Aside from buildings, the traffic distribution network (roadways, sidewalks, driveways, and parking areas) is the greatest source of watershed imperviousness. Impervious areas adversely affect runoff and recharge. Managing the imperviousness contributed by buildings, roads, and parking areas, is an important component of the site planning and design process. Methods that can be used to achieve a reduction in the total runoff volume from impervious surfaces are:

- Alternative roadway layouts that reduced paved areas but still meet transportation needs. For redeveloped areas, whole or partial removal of roads may present opportunities for improved pedestrian or bicycling uses, or for naturalizing former industrial properties.

- Use of narrow road sections reduces total site imperviousness as well as clearing and grading impacts.

- Application of sidewalks to one side of primary roads.

- Reducing on-street parking requirements to one side, or even elimination of on-street parking.

- Rooftops contribute to watershed imperviousness. In residential developments, the density of lots, house type, shape, and size can affect imperviousness. Vertical construction over horizontal layouts reduces the area of rooftop necessary for a home of equal square footage. Green roofs and rooftop gardens have become popular in recent years and can reduce site runoff. Some communities, including the City of Chicago, offer grants to offset the increased cost of green roofs on new construction.

- Driveways should be shared whenever possible, but especially in sensitive areas. Also, limit driveway width to nine feet, minimize building setbacks to reduce driveway length, and use driveway (and parking area) materials and designs which reduce runoff and increase travel times such as pervious pavers, aggregate, or carriage-style drives.

One of the design elements that will be particularly critical for NewPorte Landing is to minimize directly connected impervious areas. After site design minimizes impervious area and a preliminary site plan has been developed, additional environmental benefits can be achieved and hydrologic impacts reduced by disconnecting the unavoidable impervious areas as much as possible. Strategies for accomplishing this include:

- Disconnecting roof drains and directing flows to vegetated areas. Rain barrels and rain gardens are becoming increasingly popular in some communities.

- Directing flows from paved areas such as driveways to stabilized vegetated areas.

- Breaking up flow directions from large paved surfaces.

- Encouraging sheet flow through vegetated areas.

- Carefully locating impervious areas so that they drain to natural systems, vegetated buffers, bioswales, bioretention areas, or infiltration basins.

The time of concentration (T_c), associated with a stormwater runoff event is defined as the time it takes water to flow from the most distant point (hydraulically) to the watershed outlet. The T_c, in conjunction with other hydrologic site conditions, determines the peak discharge for a storm event. Site and infrastructure components that affect the T_c include travel distance (flow path), slope, roughness, and channel shape. Techniques that can affect and control these T_c factors can be incorporated into the site plan by managing flow and conveyance systems on and downstream of the site. Table 6-1 provides general information on structures that may be used to increase T_c, while protecting downstream habitats and waterbodies. Table 6-2 is presented for consideration by NewPorte Landing planners and engineers.

Table 6-2

STRUCTURES FOR REDUCING STORMWATER TIMES OF TRAVEL

Type	Description	Applicability
Level spreader	A stormwater outlet designed to convert concentrated runoff to sheet flow and disperse it uniformly across a stable vegetated slope to prevent erosion	Manage runoff from large impervious areas
Bioswales	Bioswales consist of a swaled drainage course, with gently sloped sides, planted with native vegetation, compost and/or riprap. Meandering channels are recommended over straight alignments. Biological factors contribute to the capture and breakdown of certain pollutants. Some maintenance required.	Most commonly applied to parking lots & large rooftops. Excellent example can be viewed at the Morton Arboretum in Lisle, Illinois.
Rain barrels and cisterns	Retaining a predetermined volume of rooftop runoff. Captured water can be reused on lawns and gardens.	Residential and small commercial buildings.
Rain gardens	Stormwater is captured in a bioretention "garden" of native plants, and the water slowly infiltrates rather than running off.	Residential and small commercial buildings.
Constructed wetlands	Akin to traditional detention ponds, stormwater wetlands temporarily store runoff in shallow pools that support Hydric vegetation.	Best used in conjunction with other BMPs. Can be sized for residential or larger developments

Swirl concentrators do not reduce T_c or concentrations of the chief pollutant of concern (phosphorus) and they are not recommended for new developments or retrofits.

6.2.1.2 Existing Developments

Residences and businesses located in proximity to lakes and waterways have a responsibility to protect those resources. Pollutant runoff, habitat damage, exotic species propagation (deliberate or otherwise) can be prevented, usually with minimal investment or effort. As the public may not be aware of proper watershed management procedures that are applicable to their properties, it becomes a public education and outreach matter.

Once the property owner has been made aware of the proper procedures for watershed protection, it is the responsibility of the community and property owner to implement these procedures. Procedures include not only maintaining vegetation and keeping structures in good condition, but also employing pollution prevention practices. If watershed management practices are part of local code, authorities can take enforcement actions on maintenance issues when there is a public nuisance or safety issue, or clear intent to destroy or functionally alter the natural ecosystem. The best enforcement mechanisms are the understanding of the importance of the watershed management functions and that the owner has pride in the community.

Industrial and commercial property owners also have responsibilities for stormwater management that can help to control and manage runoff and associated pollution from industrial sites. For larger industrial concerns, Stormwater Pollution Prevention Plans are required by NPDES permits. But all businesses should be conscious of potential problems associated with runoff, particularly from parking lots and industrial material storage areas. Local agencies and consultants can offer technical assistance to commercial and industrial property owners both to retrofit existing sites with proper technologies to minimize pollutant runoff.

Lake communities like La Porte must be especially vigilant to control of phosphorus in runoff. Phosphorus is the nutrient that limits algal productivity in most freshwater systems, including the six study lakes. Very small quantities of phosphorus can fuel tremendous algal blooms, and unless protected from this pollutant, lakes can change very quickly from being clear (like Pine and Stone Lakes) to being very green and nearly opaque (like Lily Lake). Control of watershed sources of phosphorus is therefore a key component of all lake management plans. In the lands draining to the six study lakes, the major sources of phosphorus are row crops and pasture lands (Pine and Stone Lakes), and residential, commercial, industrial, and transportation lands, and, the atmosphere (all lakes). The last of these sources, atmospheric deposition, is a regional issue and largely beyond local control. However, runoff from agricultural and urban lands is within urban control, and should be an important component of the City’s stormwater management efforts and the County agriculture extension efforts.

Table 6-3

ESTIMATED MEAN ANNUAL PHOSPHORUS LOADINGS

(in kg P per year)

Source (Sink)	Clear	Lower	Pine	Harris	Stone	Lily
Atmosphere	7.9	3.1	46	3	13	2
Low Intensity Residential	0.9	1.9	32	1	9	3
High Intensity Residential	1.4	1.7	6	1	5	6
Commercial/Industrial/Transportation	7.4	0	6	1	1	11
Deciduous Forest	0.7	0.2	27	0	4	1
Evergreen Forest	0.6	0.2	18	0	3	0
Upland Grasses & Forbs	0.3	0.1	6	0	0	0
Pasture/Hay	0.3	0.3	82	0	4	0
Row Crops	2.1	0.4	191	0	31	0
Urban/Recreational Grasses	0.7	0	6	0	1	0
(Woody Wetlands)	-0.3	0	-8	0	-1	0
(Emergent Herbaceous Wetlands)	-0.2	-1.6	-8	-1	-1	-1
Total	21.9	6.5	404	6.6	68	23.3

To protect water quality in La Porte, the City can ask watershed residents and City lawn care service providers to use zero-phosphorus lawn fertilizers. To determine the phosphorus content of fertilizer, La Porte residents can check the second number on the fertilizer formula: 15—0—10, for example, means zero phosphorus content. The first number is the nitrogen content, the middle number is the phosphorus content, and the last number is the potassium content. The La Porte SWCD has agricultural outreach services to work with farmers to manage nutrient use on their fields. Also, the SWCD can direct landowners to soil testing services, at low or no cost, to assay phosphorus status of the soil to determine if phosphorus is actually required. Additional information on use of no-phosphorus fertilizers can be found on the Indiana Lakes Management Society website: http://indianalakes.org/index_files/NoPhos.html.

6.2.2 Lake Management Recommendations

The following recommendations can be made with regard to management and improvement of the six lakes we studied.

Phosphorus is the principal pollutant accelerating the eutrophication process in all six lakes. We recommend that the City Council, Park Board, and residents integrate the following efforts to reduce overall nutrient flow into all lakes:

- Continued protection of undeveloped land adjacent to lakes and wetlands.
- Planting of buffer strips using native vegetation along shorelines where lawns go right to the water edge. Native plant buffers have recently been planted along a portion of Clear Lake's shore, and we encourage the City to monitor those plantings, modify the plant list as appropriate, and continue native plantings as budgets and grants allow.
- Public education regarding the use of non-phosphorus fertilizers. We recommend that the City mail an information packet to lakeside residents and businesses containing information on lawn nutrient management. The materials could also address exotic species and protection of beds of the state-endangered *Myriophyllum tenellum* (slender milfoil).
- Continued SWCD consultation with agricultural interests in the watersheds. The SWCD should proactively offer assistance with nutrient management planning, particularly soil testing services, to landowners and encourage reduce phosphorus use in these sensitive watersheds.

Exotic species must be controlled to maintain current recreational and ecological uses. We recommend that the City, La Porte Area Lake Association and other non-governmental organizations, the SWCD and DNR organize an "Exotics Control Day". This might be part of a larger lakes "clean-up" day, but would assemble a work force to control emergent exotic plants, namely phragmites and purple loosestrife, along the shorelines of all lakes. Mowing, hand-pulling, and herbicide application (by trained individuals only) could make significant progress at controlling these plants. The event should be scheduled before the flowering of purple loosestrife. Other exotics such as mustard garlic or buckthorn could also be targeted in this action if sufficient labor is available.

6.2.2.1 Clear Lake

In addition to phosphorus controls and BMPs, and the control of exotics species, the following recommendations are put forward for consideration at Clear Lake. The current aquatic plant harvesting program may be removing phosphorus from Clear Lake and benefiting its water quality, but the machine produces fragments of Eurasian water-milfoil that can regenerate. This may be the reason water-milfoil is so evenly distributed across Clear Lake. The harvesting as it is currently being implemented is not reducing the coverage of Eurasian water-milfoil or improving lake use. We recommend that the City find a lasting solution to the Eurasian water-milfoil problem on Clear Lake. We recommend consideration of either a whole-lake fluridone treatment or the stocking of aquatic weevils. Control of Eurasian water-milfoil is an important consideration especially in light of plans for the development of NewPorte Landing. LARE funds can be applied for to fund a whole-lake herbicide or a weevil introduction. We recommend a three-year post-treatment monitoring of the changing status of Eurasian water-milfoil.

The City should request the IDEM to sample the sediment of Clear Lake and the two small ponds on the former Allis Chalmers property, and, to test the sediment for contaminants. Fish should also be sampled and their tissue analyzed for contaminants. A written request from the Mayor's Office may be best in this matter.

The City should continue to plant native vegetation around Clear Lake. As the recent shoreline plantings mature and begin to seed, the area can be used for seed collection to support further plantings. Roadside mowing can and should be reduced.

The stormwater alum doser at Clear Lake has recurring mechanical problems. Assuming these can be rectified, higher alum doses should be used. As long as the lake level remains low, the repairs and operational changes can be deferred, but we strongly endorse this pollutant control technology and encourage the City to repair the doser and increase the use of alum in future years.

6.2.2.2 Lily Lake

Preventative measures need to be taken to curb the rate of eutrophication of Lily Lake. As the impervious areas draining the shopping center across Pine Lake Avenue and perhaps the NewPorte Landing Project, stormwater Best Management Practices (BMPs) should be installed and maintained to improve runoff quality and quantity. This is consistent with La Porte's MS4 program. BMPs will reduce nutrient loading of the lake. Potential effective BMPs might include constructed wetlands, rain gardens, pervious pavement, bioswales and infiltration basins, and, alum treatment and settling. The LARE Program could be approached for assistance with an engineering feasibility study of potential solutions to the stormwater pollutant loads coming from the shopping center; construction efforts might be eligible for LARE or Section 319 grant funding.

The City should consider a carp population reduction effort for Lily Lake. The DNR Division of Fish and Wildlife can be consulted for assistance.

Lily Lake has no data on contaminant ecology. The City should also request the IDEM to sample and test fish tissue and sediment in Lily Lake for contaminants.

6.2.2.3 Lower Lake

Park planners should consider a boardwalk on Lower Lake off Lindewald Park. The extensive wetland provides an excellent viewing location for wildlife. It can include educational features on exotic species, biodiversity, hydrologic cycles, and water pollution.

6.2.2.4 Pine, Stone, and Harris Lakes

Pine and Stone Lake are two of the finest lakes in the State. The City (or county) should consider preservation of any remaining undeveloped land around these two lakes.

The aforementioned phosphorus BMPs, and the exotics control efforts, apply to these lakes as well. The La Porte Area Lakes Association has been active in controlling Eurasian water-milfoil on Pine Lake, and we encourage them to continue to monitor and treat new infestations as they develop.

The City include Pine and Stone Lakes in their request to the IDEM for sediment and fish tissue testing for contaminants. Fish may present a risk to anglers opting to eat their catch.

Pine Lake is notable for a colony of the state-endangered *Myriophyllum tenellum* (slender milfoil). It forms substantial beds off of the point in Pine Lake and on the northeast relatively undisturbed parts of the shore. It grows in shallow water up to about three feet deep and is very susceptible to damage from personal watercraft and low lake levels. The City should consider petitioning the DNR to establish an “ecozone” (no-wake or no boat landing zone) to protect this rare plant. Signage could be erected identifying the slender milfoil as a protected plant. A competition for school children could be held as a way to create signage and elevate awareness of this rare plant.

Bank erosion is not a problem except in the vicinity of the channel connecting Pine and Stone Lakes. In the past, a jetty was proposed on the Pine Lake side to intercept wind-driven sediment. The channel itself could be rip-rapped (or bioengineered) to stabilize eroding banks.

Harris Lake is also a candidate for an environmental education facility. Wildlife viewing platforms, boardwalks, and educational exhibits are suited for this site. The City could approach a local corporate or not-for-profit group to sponsor such a facility.

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EXHIBITS

EXHIBITS

TOWNSHIP	TOTAL_POP	MALE	FEMALE	MEDIAN_AGE	HOUSEHOLDS	FAMILIES	WITH_CHILD	AV_SIZE	HOUSE_UNIT	OWNER_OCC	RENTER_OCC	NO_LAKES
Cass	1677	845	832	38.4	639	504	199	2.62	659	550	89	0
Center	24405	12009	12396	36.6	9723	6450	3083	2.46	10506	6783	2940	10
Clinton	4454	3788	666	33.9	485	387	185	2.80	500	440	45	0
Coolspring	14910	7115	7795	39.7	6023	4159	1823	2.44	6374	4144	1879	6
Dewey	970	480	490	39.4	384	279	117	2.53	407	321	63	0
Galena	1710	874	836	41.2	650	523	208	2.63	828	595	55	5
Hanna	993	510	483	36.7	354	268	121	2.81	369	317	37	0
Hudson	1909	974	935	39.7	764	545	240	2.50	937	660	104	2
Johnson	221	113	108	39.9	80	65	27	2.76	82	63	17	0
Kankakee	4307	2130	2177	35.8	1585	1195	553	2.72	1713	1413	172	0
Lincoln	1835	936	899	39.4	714	544	217	2.57	921	646	68	2
Michigan	29326	15100	14226	36.2	10936	7142	3286	2.46	13018	7613	3323	2
New Durham	4095	2046	2049	37.3	1641	1116	506	2.50	1784	1360	281	3
Noble	1563	798	765	36.7	560	437	217	2.79	574	509	51	1
Pleasant	3125	1511	1614	36.8	1175	893	425	2.65	1236	939	236	0
Prairie	181	86	95	40.8	72	49	24	2.51	76	58	14	0
Scipio	4269	2073	2196	41.6	1571	1196	517	2.60	1642	1304	267	0
Springfield	4742	2401	2341	39.3	1826	1324	570	2.59	2025	1556	270	0
Union	2484	1264	1220	33.2	875	680	338	2.84	945	690	185	0
Washington	1103	553	550	37.1	376	318	140	2.93	385	328	48	0
Wills	1827	933	894	35.4	617	523	274	2.96	640	572	45	4
	110,106	56,539	53,567	37.3	41,050	28,597	13,070	2.65	45,621	30,861	10,189	35

Exhibit 1

LA PORTE COUNTY 2000 CENSUS DATA AND LAKES, BY TOWNSHIP

Sources: http://danpatch.ecn.purdue.edu/~caagis/ftp/gisdata/data.html and http://igs.indiana.edu/arcims/statewide/dload_page/hydrology.html

Map Symbol	Unit Name	Clear Lake	Lower Lake	Pine Lake	Harris Wetland	Stone Lake	Lily Lake
BaA	Blount silt loam, 0 to 3 percent slopes	0	0	80	0	0	0
Br	Bourbon sandy loam	0	0	29	0	17	0
Cd	Cheektowaga fine sandy loam	0	0	12	0	0	0
ChB	Chelsea fine sand, 2 to 6 percent slopes	0	0	11	0	0	0
CoA	Coupee silt loam, 0 to 2 percent slopes	0	0	15	0	49	0
CoB	Coupee silt loam, 2 to 6 percent slopes	0	0	4	0	96	0
EsA	Elston loam, 0 to 2 percent slopes	0	0	36	0	0	0
EsB	Elston loam, 2 to 6 percent slopes	0	0	75	0	0	0
Gf	Gilford fine sandy loam	13	5	8	0	0	0
HaA	Hanna sandy loam, 0 to 3 percent slopes	0	0	24	0	2	0
Hh	Histosols and Aquolls	11	7	65	44	28	19
Hk	Homer loam	0	0	53	0	0	0
Hm	Houghton muck	0	0	18	0	0	0
MrB2	Morley silt loam, 2 to 6 percent slopes, eroded	0	0	102	0	0	0
MrC2	Morley silt loam, 6 to 12 percent slopes, eroded	0	0	24	0	0	0
Pe	Pewamo silty clay loam	0	0	5	0	0	0
Ph	Pinhook loam	0	0	3	3	4	4
RIA	Riddles loam, 0 to 2 percent slopes	0	0	18	0	0	0
RIB2	Riddles loam, 2 to 6 percent slopes, eroded	0	0	688	0	0	0
RIC2	Riddles loam, 6 to 12 percent slopes, eroded	0	0	143	0	0	0
RID2	Riddles loam, 12 to 18 percent slopes, eroded	0	0	104	0	0	0
RIF	Riddles loam, 25 to 45 percent slopes	0	0	7	0	0	0
Sb	Sebewa loam, shaly sand substratum	0	0	3	0	0	0
SeA	Selfridge loamy fine sand, 0 to 2 percent slopes	0	0	23	0	0	0
SeB	Selfridge loamy fine sand, 2 to 6 percent slopes	0	0	53	0	0	0
TcA	Tracy sandy loam, 0 to 2 percent slopes	0	0	119	0	15	0
TcB	Tracy sandy loam, 2 to 6 percent slopes	13	18	1525	2	156	0
TcC2	Tracy sandy loam, 6 to 12 percent slopes, eroded	35	28	941	0	185	0
TcD2	Tracy sandy loam, 12 to 18 percent slopes, eroded	0	2	371	0	6	0
TcF	Tracy sandy loam, 25 to 45 percent slopes	0	0	71	12	73	12
Tr	Troxel silt loam	0	0	51	0	4	0
Ua	Udorthents, loamy	16	10	43	7	13	0
Uc	Urban land-Coupee complex	219	2	73	39	67	233
W	Water	110	37	850	0	190	35
Wa	Wallkill silt loam	0	0	19	0	0	0
Wh	Washtenaw silt loam	1	0	123	0	24	0
	Totals (acres)	419	109	5790	108	929	303

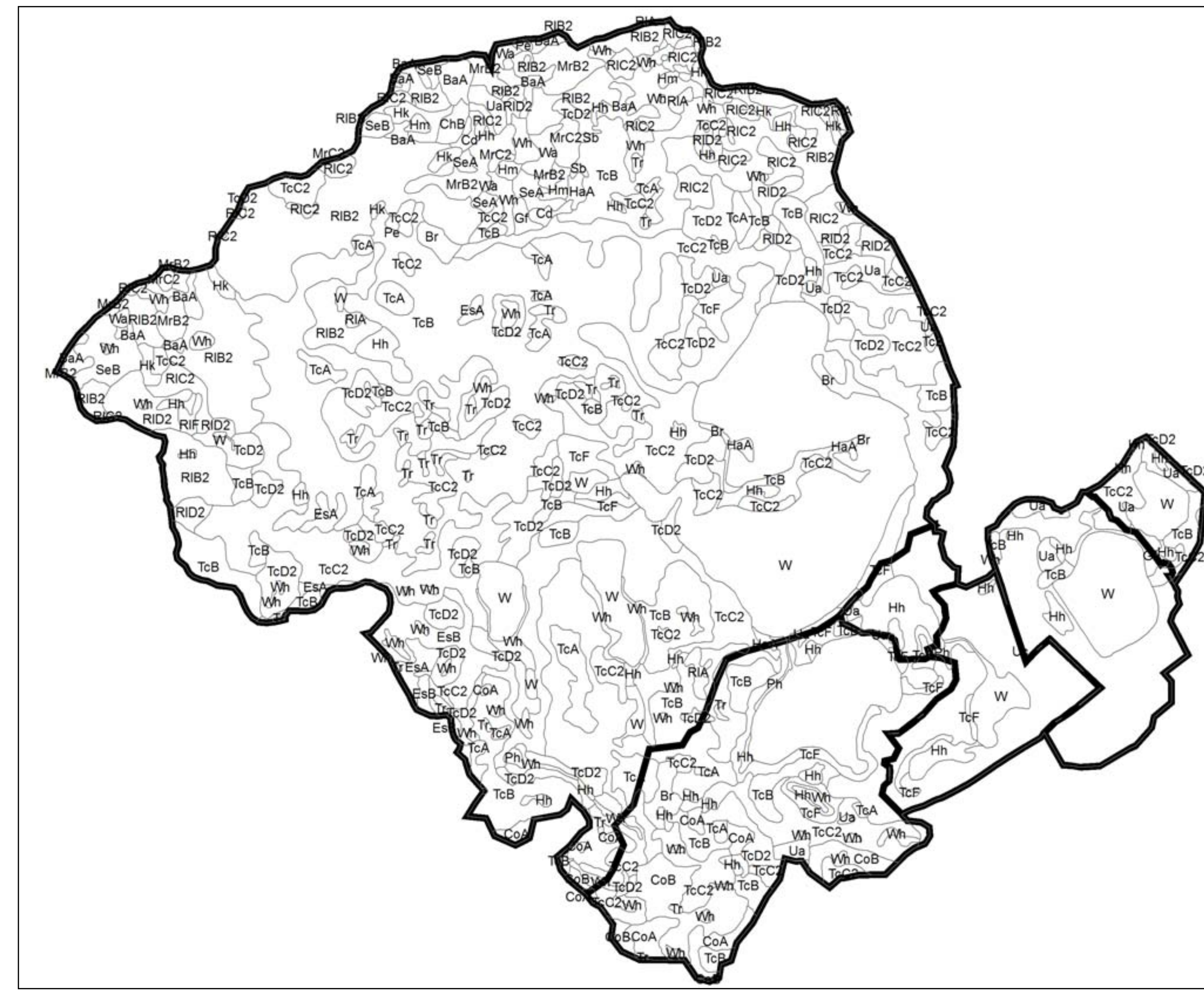
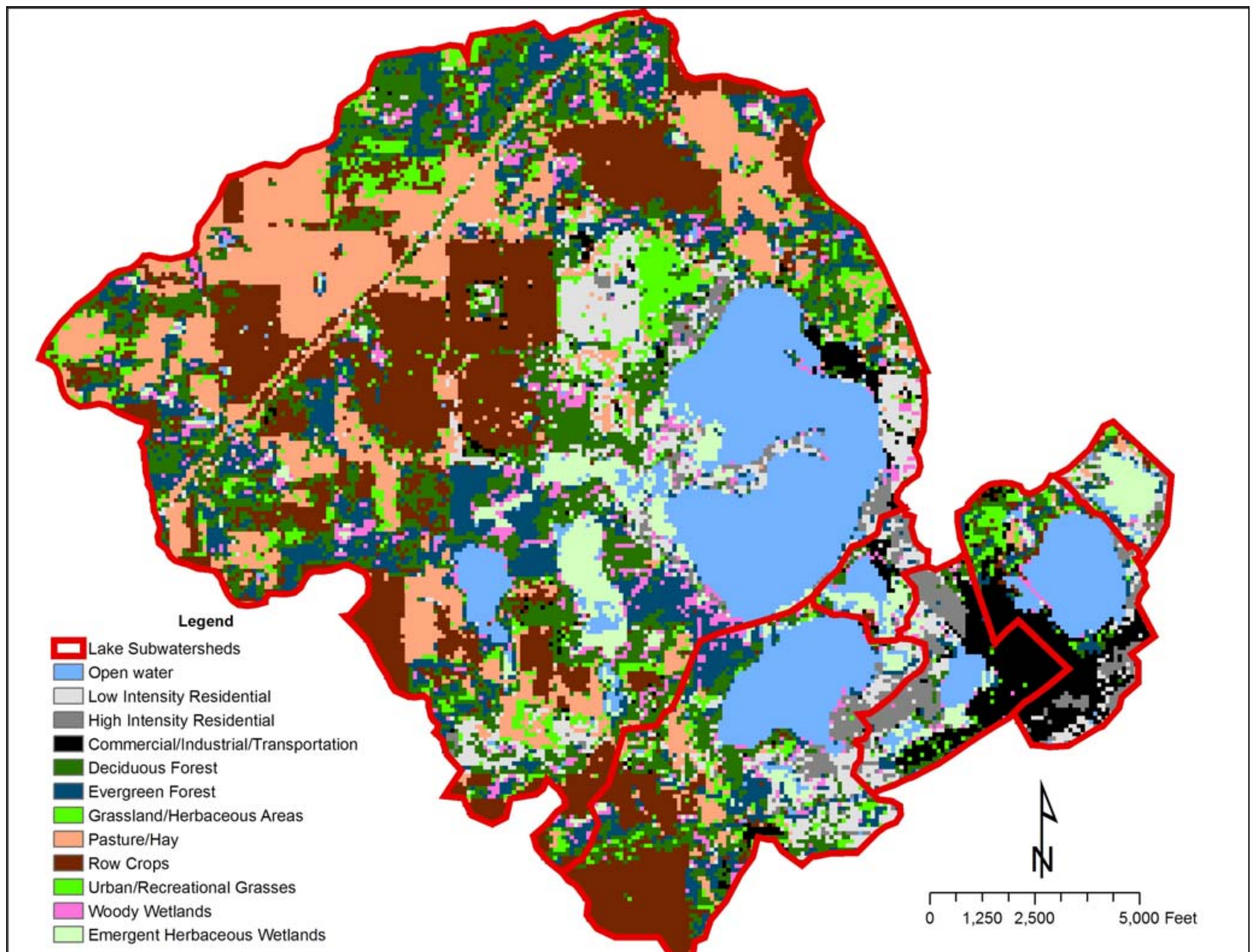


Exhibit 2

SUBWATERSHED SOILS

(Source: Developed from Soil Survey Geographic Database (SSURGO), available at http://www.ncgc.nrcs.usda.gov/products/datasets/ssurgo/)

Land Use / Cover	Clear Lake	Lower Lake	Pine Lake	Harris Wetland	Stone Lake	Lily Lake	Description
	Area (in acres)						
Open Water	129	6	686	26	189	33	All areas of open water; typically 25 percent or greater cover of water (per pixel).
Low Intensity Residential	22	19	320	14	87	30	Areas with a mixture of constructed materials and vegetation. Constructed materials account for 30-80 percent of materials and vegetation.
High Intensity Residential	33	16	61	13	46	63	Highly developed areas where people reside in high numbers. Constructed materials account for 80 to 100 percent of the cover.
Commercial/Industrial/Transportation	133	0	63	11	12	112	Infrastructure and all highly developed areas not classified as High Intensity Residential.
Deciduous Forest	25	8	952	8	139	19	Areas dominated by trees where 75 percent or more of the tree species shed foliage simultaneously in response to seasonal change.
Evergreen Forest	22	8	637	5	106	14	Areas dominated by trees where 75 %t or more of the tree species maintain their leaves all year. Canopy is never without green foliage.
Upland Grasses & Forbs	9	2	199	0	11	1	Areas dominated by upland grasses and forbs.
Pasture/Hay	4	4	1015	0	44	0	Areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops.
Row Crops	13	3	1178	2	189	0	Areas used for the production of crops such as corn, soybeans, vegetables and tobacco.
Urban/Recreational Grasses	18	1	138	1	27	6	Vegetation (primarily grasses) planted in developed settings for recreation, erosion control or aesthetic purposes. Parks, lawns, golf courses, and airport grasses are examples.
Woody Wetlands	7	1	199	5	29	8	Areas where forest or shrub land vegetation accounts for 25 to 100% of the cover and the soil is periodically saturated.
Emergent Herbaceous Wetlands	4	38	198	22	25	19	Areas where perennial herbaceous vegetation accounts for 75 to 100% of the cover and the soil is periodically saturated.
Totals	419	109	5646	109	904	304	



Note: Tabular data developed from raster dataset, available from http://igs.indiana.edu/arcims/lrim/index.html. The land use data are derived from pixilated imagery that is manipulated using ArcGIS software. Subwatershed total areas derived from pixilated imagery may differ slightly from areas developed from vector data, such as the soils table.

Exhibit 3

SUBWATERSHED LAND USE / LAND COVER IN THE STUDY AREA

Latitude	Longitude	Receving Water	Landmark	Type	Source	City_ID	Baetis_ID
41.61593	-86.72232	Clear Lake	alum trap	42	Baetis	160	1
41.61748	-86.72415	Clear Lake	Hoedocker (from AC wetland)		Baetis	150	2
41.62075	-86.71848	Clear Lake	Clear Lake Blvd	small sedimented	Baetis	170	3
41.61921	-86.71785	Clear Lake	Clear Lake Blvd	12-PVC	Baetis	191	4
41.61785	-86.71824	Clear Lake	Clear Lake/Furnace	12-corrugated	Baetis	180	5
41.61700	-86.71956	Clear Lake	Clear Lake Blvd	12-corrugated	Baetis	0	6
41.61650	-86.72053	Clear Lake	Clear Lake/Detroit	12-corrugated	Baetis	161	7
41.61639	-86.72053	Clear Lake	Clear Lake/Detroit	12-corrugated	Baetis	162	8
41.615010	-86.73055	Lily Lake	120 Pine Lake Ave	24-RCP	Baetis		9
41.61430	-86.72966	Lily Lake	across from Kroger	double elliptical RCP	Baetis	90	10
41.63262	-86.74106	Pine Lake	Johnson Rd	16-RCP	Baetis		11
41.63202	-86.73966	Pine Lake	39 & 35	24-RCP	Baetis		12
41.60990	-86.74373	Stone Lake		8-corrugated	Baetis		13
41.61058	-86.74376	Stone Lake		8-corrugated	Baetis		14
41.61132	-86.74360	Stone Lake		12-corrugated	Baetis		15
41.61243	-86.74060	Stone Lake	310 Lakeshore	10-corrugated	Baetis		16
41.61236	-86.74090	Stone Lake	Lakeshore/Greenleaf	12-iron ductile	Baetis		17
41.61824	-86.73640	Harris Wetland	Parks Dept	12-corrugated	Baetis		18
		Lily Lake Channel	Weller Ave		Wastewater Dept	100	19
		Lily Lake Channel	Weller Ave		Wastewater Dept	101	20
		Pine Lake	1380 Lakeside		Wastewater Dept	10	21
		Pine Lake	700 Lakeside		Wastewater Dept	20	22
		Pine Lake	600 Lakeside		Wastewater Dept	30	23
		Fremont Wetland	600 Fremont		Wastewater Dept	40	24
		Craven Pond	Craven / Pennsylvania		Wastewater Dept	130	25
		Craven Pond	Craven / Weller		Wastewater Dept	140	26
		Central Wetland	Woodbine		Wastewater Dept	200	27
		Central Wetland	Greenleaf		Wastewater Dept	201	28
		Harris Wetland Channel	Wardner St		Wastewater Dept	120	29
		Harris Wetland	Pine Lake Ave & Williams St		Wastewater Dept		30
		Harris Wetland	Pine Lake Ave		Wastewater Dept		31

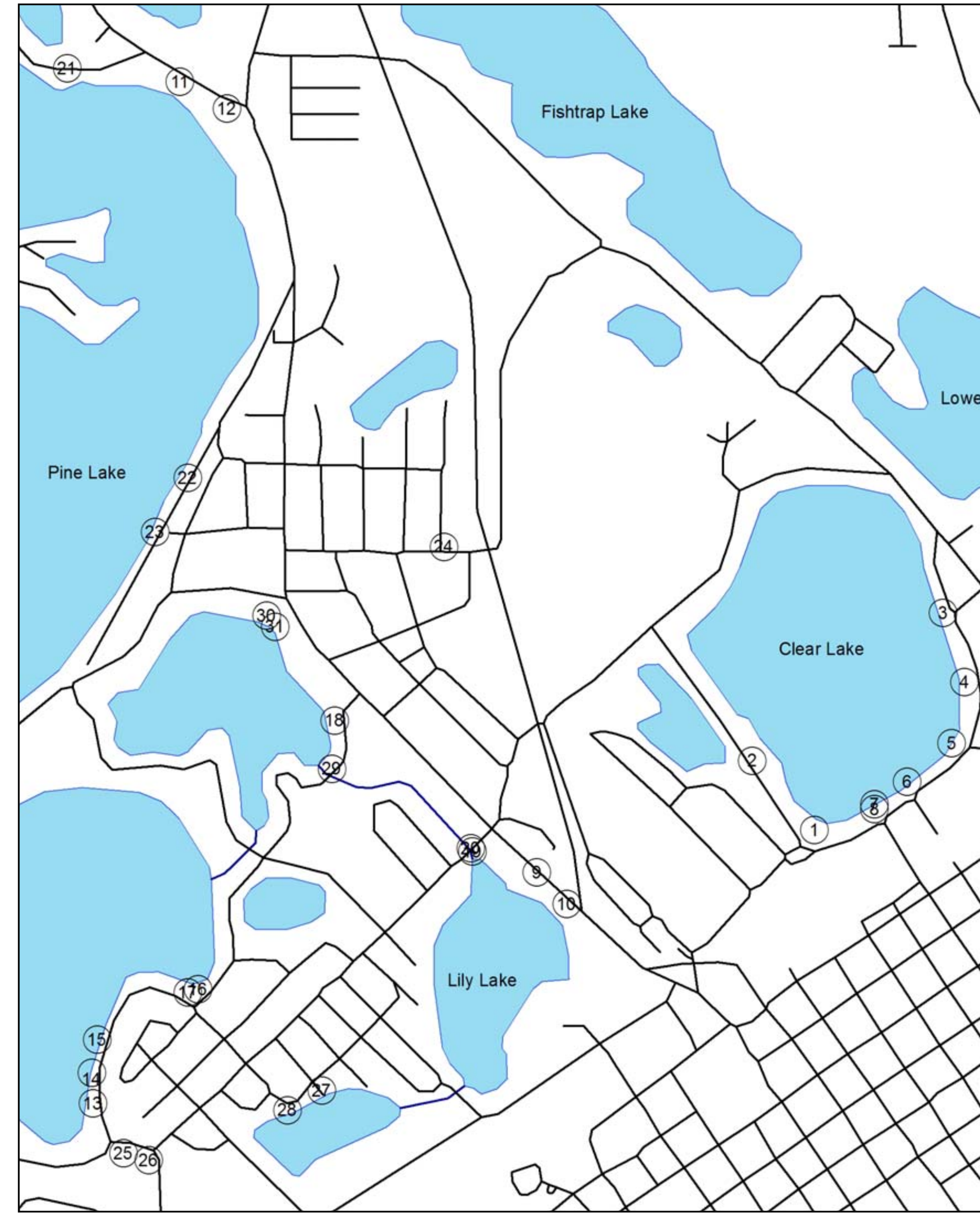


Exhibit 4

STORMWATER OUTFALLS IN THE STUDY AREA

STREAMNAME	SAMPLEDATE	XSAMPLEDEPTH	Parameter	Result	Units
Stone	16-Aug-89	1.0 meters	Light Trans @ 3 ft.	44	%T
Stone	16-Aug-89	1.5 meters	% Sat	105	%
Stone	16-Aug-89	surface	% Water Column Oxic	82	%
Stone	16-Aug-89	surface	Secchi Depth	4.2	meters
Stone	16-Aug-89		Blue-Green Algae	19149	
Stone	16-Aug-89		Diatoms	308	
Stone	16-Aug-89		Green Algae	438	
Stone	16-Aug-89		MicroCrustacea	171	
Stone	16-Aug-89	epilimnion	Nitrogen, Ammonia	0.039	mg/L
Stone	16-Aug-89	epilimnion	Nitrogen, Nitrate+Nitrite	2.521	mg/L
Stone	16-Aug-89	epilimnion	Phosphorus, (Applicable to all forms)	0.101	mg/L
Stone	16-Aug-89	epilimnion	TKN	-1	mg/L
Stone	16-Aug-89	hypolimnion	Nitrogen, Ammonia	0.451	mg/L
Stone	16-Aug-89	hypolimnion	Nitrogen, Nitrate+Nitrite	3.687	mg/L
Stone	16-Aug-89	hypolimnion	Phosphorus, (Applicable to all forms)	0.048	mg/L
Stone	16-Aug-89	hypolimnion	Phosphorus, ortho (Dissolved)	0.002	mg/L
Stone	16-Aug-89	hypolimnion	TKN	-1	mg/L
Stone	18-Jul-95	1.0 meters	DO	6.7	mg/L
Stone	18-Jul-95	1.0 meters	Light Trans @ 3 ft.	45	%T
Stone	18-Jul-95	1.0 meters	Temperature	29.4	°C
Stone	18-Jul-95	1.5 meters	% Sat	88.4	%
Stone	18-Jul-95	1.5 meters	DO	6.8	mg/L
Stone	18-Jul-95	1.5 meters	Temperature	29.3	°C
Stone	18-Jul-95	10.0 meters	DO	0.2	mg/L
Stone	18-Jul-95	10.0 meters	Temperature	12	°C
Stone	18-Jul-95	11.0 meters	DO	0.1	mg/L
Stone	18-Jul-95	11.0 meters	Temperature	11.4	°C
Stone	18-Jul-95	2.0 meters	DO	6.9	mg/L
Stone	18-Jul-95	2.0 meters	Temperature	29.2	°C
Stone	18-Jul-95	3.0 meters	DO	7.2	mg/L
Stone	18-Jul-95	3.0 meters	Temperature	28.9	°C
Stone	18-Jul-95	4.0 meters	DO	7.8	mg/L
Stone	18-Jul-95	4.0 meters	Temperature	26.6	°C
Stone	18-Jul-95	5.0 meters	DO	8	mg/L
Stone	18-Jul-95	5.0 meters	Temperature	25.1	°C
Stone	18-Jul-95	6.0 meters	DO	8.6	mg/L
Stone	18-Jul-95	6.0 meters	Temperature	21.6	°C
Stone	18-Jul-95	7.0 meters	DO	9	mg/L
Stone	18-Jul-95	7.0 meters	Temperature	17.7	°C
Stone	18-Jul-95	8.0 meters	DO	9	mg/L
Stone	18-Jul-95	8.0 meters	Temperature	15.1	°C
Stone	18-Jul-95	9.0 meters	DO	1	mg/L
Stone	18-Jul-95	9.0 meters	Temperature	13.2	°C
Stone	18-Jul-95	epilimnion	pH	8.1	SU
Stone	18-Jul-95	epilimnion	Specific Conductance (Field)	302	umho/cm
Stone	18-Jul-95	hypolimnion	pH	6.8	SU
Stone	18-Jul-95	hypolimnion	Specific Conductance (Field)	260	umho/cm
Stone	18-Jul-95	surface	% Water Column Oxic	100	%
Stone	18-Jul-95	surface	1% Light Level	20.8	feet
Stone	18-Jul-95	surface	DO	6.4	mg/L
Stone	18-Jul-95	surface	Secchi Depth	3.5	meters
Stone	18-Jul-95	surface	Temperature	29.5	°C
Stone	18-Jul-95		Blue-Green Algae	7514	
Stone	18-Jul-95		Diatoms	4560	
Stone	18-Jul-95		Green Algae	222	
Stone	18-Jul-95		MicroCrustacea	10	
Stone	18-Jul-95		Rotifers	70	
Stone	18-Jul-95	epilimnion	Alkalinity (as CaCO3)	85.5	mg/L
Stone	18-Jul-95	epilimnion	Chlorophyll a	2.27	ug/L
Stone	18-Jul-95	epilimnion	Nitrogen, Ammonia	0.053	mg/L
Stone	18-Jul-95	epilimnion	Nitrogen, Nitrate+Nitrite	0.07	mg/L
Stone	18-Jul-95	epilimnion	Phosphorus, (Applicable to all forms)	0.021	mg/L
Stone	18-Jul-95	epilimnion	Phosphorus, ortho (Dissolved)	0.005	mg/L
Stone	18-Jul-95	epilimnion	TKN	0.55	mg/L
Stone	18-Jul-95	hypolimnion	Alkalinity (as CaCO3)	113	mg/L

STREAMNAME	SAMPLEDATE	XSAMPLEDEPTH	Parameter	Result	Units
Stone	18-Jul-95	hypolimnion	Nitrogen, Ammonia	0.433	mg/L
Stone	18-Jul-95	hypolimnion	Nitrogen, Nitrate+Nitrite	0.022	mg/L
Stone	18-Jul-95	hypolimnion	Phosphorus, (Applicable to all forms)	0.078	mg/L
Stone	18-Jul-95	hypolimnion	Phosphorus, ortho (Dissolved)	0.008	mg/L
Stone	18-Jul-95	hypolimnion	TKN	1.303	mg/L
Stone	13-Jul-99	1.0 meters	DO	8.8	mg/L
Stone	13-Jul-99	1.0 meters	Light Trans @ 3 ft.	57	%T
Stone	13-Jul-99	1.0 meters	Temperature	24.5	°C
Stone	13-Jul-99	1.5 meters	% Sat	105	%
Stone	13-Jul-99	1.5 meters	DO	8.8	mg/L
Stone	13-Jul-99	1.5 meters	Temperature	24	°C
Stone	13-Jul-99	10.0 meters	DO	0.4	mg/L
Stone	13-Jul-99	10.0 meters	Temperature	8.5	°C
Stone	13-Jul-99	11.0 meters	DO	0.2	mg/L
Stone	13-Jul-99	11.0 meters	Temperature	8	°C
Stone	13-Jul-99	2.0 meters	DO	8.7	mg/L
Stone	13-Jul-99	2.0 meters	Temperature	24	°C
Stone	13-Jul-99	3.0 meters	DO	9	mg/L
Stone	13-Jul-99	3.0 meters	Temperature	24	°C
Stone	13-Jul-99	4.0 meters	DO	9	mg/L
Stone	13-Jul-99	4.0 meters	Temperature	24	°C
Stone	13-Jul-99	5.0 meters	DO	8.6	mg/L
Stone	13-Jul-99	5.0 meters	Temperature	23	°C
Stone	13-Jul-99	6.0 meters	DO	6.5	mg/L
Stone	13-Jul-99	6.0 meters	Temperature	19	°C
Stone	13-Jul-99	7.0 meters	DO	6.6	mg/L
Stone	13-Jul-99	7.0 meters	Temperature	15	°C
Stone	13-Jul-99	8.0 meters	DO	5.3	mg/L
Stone	13-Jul-99	8.0 meters	Temperature	12	°C
Stone	13-Jul-99	9.0 meters	DO	0.5	mg/L
Stone	13-Jul-99	9.0 meters	Temperature	10	°C
Stone	13-Jul-99	epilimnion	pH	8.2	SU
Stone	13-Jul-99	epilimnion	Specific Conductance (Field)	280	umho/cm
Stone	13-Jul-99	hypolimnion	pH	6.8	SU
Stone	13-Jul-99	hypolimnion	Specific Conductance (Field)	235	umho/cm
Stone	13-Jul-99	surface	% Water Column Oxic	87	%
Stone	13-Jul-99	surface	1% Light Level	30.5	feet
Stone	13-Jul-99	surface	DO	8.8	mg/L
Stone	13-Jul-99	surface	Secchi Depth	6.7	meters
Stone	13-Jul-99	surface	Temperature	25	°C
Stone	13-Jul-99		Blue-Green Algae	3694	
Stone	13-Jul-99		Diatoms	732	
Stone	13-Jul-99		Green Algae	93	
Stone	13-Jul-99		MicroCrustacea	8	
Stone	13-Jul-99		Rotifers	29	
Stone	13-Jul-99	epilimnion	Alkalinity (as CaCO3)	77	mg/L
Stone	13-Jul-99	epilimnion	Chlorophyll a	0.02	ug/L
Stone	13-Jul-99	epilimnion	Nitrogen, Ammonia	0.018	mg/L
Stone	13-Jul-99	epilimnion	Nitrogen, Nitrate+Nitrite	0.022	mg/L
Stone	13-Jul-99	epilimnion	Phosphorus, (Applicable to all forms)	0.041	mg/L
Stone	13-Jul-99	epilimnion	Phosphorus, ortho (Dissolved)	0.01	mg/L
Stone	13-Jul-99	epilimnion	TKN	0.863	mg/L
Stone	13-Jul-99	hypolimnion	Alkalinity (as CaCO3)	98	mg/L
Stone	13-Jul-99	hypolimnion	Nitrogen, Ammonia	0.245	mg/L
Stone	13-Jul-99	hypolimnion	Nitrogen, Nitrate+Nitrite	0.022	mg/L
Stone	13-Jul-99	hypolimnion	Phosphorus, (Applicable to all forms)	0.048	mg/L
Stone	13-Jul-99	hypolimnion	Phosphorus, ortho (Dissolved)	0.008	mg/L
Stone	13-Jul-99	hypolimnion	TKN	1.293	mg/L

Exhibit 5

HISTORIC STONE LAKE WATER QUALITY DATA

Source: Indiana Department of Environmental Management

STREAMNAME	SAMPLEDATE	FIELDLABDATATYPE	XSAMPLEDEPTH	Parameter	Result	Units
Pine	21-Aug-89	Field	1.0 meters	Light Trans @ 3 ft.	40	%T
Pine	21-Aug-89	Field	1.5 meters	% Sat	103	%
Pine	21-Aug-89	Field	surface	% Water Column Oxic	64.29	%
Pine	21-Aug-89	Field	surface	Secchi Depth	2.899	meters
Pine	21-Aug-89	Lab		Blue-Green Algae	2067	
Pine	21-Aug-89	Lab		Diatoms	465	
Pine	21-Aug-89	Lab		Green Algae	499	
Pine	21-Aug-89	Lab		MicroCrustacea	181	
Pine	21-Aug-89	Lab	epilimnion	Nitrogen, Ammonia	0.052	mg/L
Pine	21-Aug-89	Lab	epilimnion	Nitrogen, Nitrate+Nitrite	3.077	mg/L
Pine	21-Aug-89	Lab	epilimnion	Phosphorus, (Applicable to all forms)	0.034	mg/L
Pine	21-Aug-89	Lab	epilimnion	Phosphorus, ortho (Dissolved)	0.002	mg/L
Pine	21-Aug-89	Lab	epilimnion	TKN	-1	mg/L
Pine	21-Aug-89	Lab	hypolimnion	Nitrogen, Ammonia	1.367	mg/L
Pine	21-Aug-89	Lab	hypolimnion	Nitrogen, Nitrate+Nitrite	3.164	mg/L
Pine	21-Aug-89	Lab	hypolimnion	Phosphorus, (Applicable to all forms)	0.153	mg/L
Pine	21-Aug-89	Lab	hypolimnion	Phosphorus, ortho (Dissolved)	0.107	mg/L
Pine	21-Aug-89	Lab	hypolimnion	TKN	-1	mg/L
Pine	13-Jul-99	Field	1.0 meters	DO	8.6	mg/L
Pine	13-Jul-99	Field	1.0 meters	Light Trans @ 3 ft.	85	%T
Pine	13-Jul-99	Field	1.0 meters	Temperature	24	°C
Pine	13-Jul-99	Field	1.5 meters	% Sat	102	%
Pine	13-Jul-99	Field	1.5 meters	DO	8.6	mg/L
Pine	13-Jul-99	Field	1.5 meters	Temperature	24	°C
Pine	13-Jul-99	Field	10.0 meters	DO	0.6	mg/L
Pine	13-Jul-99	Field	10.0 meters	Temperature	9.5	°C
Pine	13-Jul-99	Field	11.0 meters	DO	0.4	mg/L
Pine	13-Jul-99	Field	11.0 meters	Temperature	8.5	°C
Pine	13-Jul-99	Field	12.0 meters	DO	0.4	mg/L
Pine	13-Jul-99	Field	12.0 meters	Temperature	8	°C
Pine	13-Jul-99	Field	13.0 meters	DO	0.3	mg/L
Pine	13-Jul-99	Field	13.0 meters	Temperature	7	°C
Pine	13-Jul-99	Field	14.0 meters	DO	0.2	mg/L
Pine	13-Jul-99	Field	14.0 meters	Temperature	7	°C
Pine	13-Jul-99	Field	15.0 meters	DO	0.2	mg/L
Pine	13-Jul-99	Field	15.0 meters	Temperature	6.5	°C
Pine	13-Jul-99	Field	16.0 meters	DO	0.2	mg/L
Pine	13-Jul-99	Field	16.0 meters	Temperature	6	°C
Pine	13-Jul-99	Field	2.0 meters	DO	8.6	mg/L
Pine	13-Jul-99	Field	2.0 meters	Temperature	24	°C
Pine	13-Jul-99	Field	3.0 meters	DO	8.5	mg/L
Pine	13-Jul-99	Field	3.0 meters	Temperature	24	°C
Pine	13-Jul-99	Field	4.0 meters	DO	8.5	mg/L
Pine	13-Jul-99	Field	4.0 meters	Temperature	24	°C
Pine	13-Jul-99	Field	5.0 meters	DO	8.1	mg/L
Pine	13-Jul-99	Field	5.0 meters	Temperature	23.5	°C
Pine	13-Jul-99	Field	6.0 meters	DO	7.6	mg/L
Pine	13-Jul-99	Field	6.0 meters	Temperature	21	°C
Pine	13-Jul-99	Field	7.0 meters	DO	5	mg/L
Pine	13-Jul-99	Field	7.0 meters	Temperature	16	°C
Pine	13-Jul-99	Field	8.0 meters	DO	4.2	mg/L
Pine	13-Jul-99	Field	8.0 meters	Temperature	13	°C
Pine	13-Jul-99	Field	9.0 meters	DO	2.6	mg/L
Pine	13-Jul-99	Field	9.0 meters	Temperature	11	°C
Pine	13-Jul-99	Field	epilimnion	pH	6.9	SU
Pine	13-Jul-99	Field	epilimnion	Specific Conductance (Field)	305	umho/cm
Pine	13-Jul-99	Field	hypolimnion	pH	6.5	SU
Pine	13-Jul-99	Field	hypolimnion	Specific Conductance (Field)	295	umho/cm
Pine	13-Jul-99	Field	surface	% Water Column Oxic	60	%
Pine	13-Jul-99	Field	surface	1% Light Level	31.5	feet
Pine	13-Jul-99	Field	surface	DO	8.6	mg/L
Pine	13-Jul-99	Field	surface	Secchi Depth	5.8	meters
Pine	13-Jul-99	Field	surface	Temperature	24	°C
Pine	13-Jul-99	Lab		Blue-Green Algae	17	
Pine	13-Jul-99	Lab		Diatoms	967	
Pine	13-Jul-99	Lab		Green Algae	7	
Pine	13-Jul-99	Lab		MicroCrustacea	6	
Pine	13-Jul-99	Lab		Rotifers	20	
Pine	13-Jul-99	Lab	epilimnion	Alkalinity (as CaCO3)	65	mg/L
Pine	13-Jul-99	Lab	epilimnion	Chlorophyll a	1.18	ug/L
Pine	13-Jul-99	Lab	epilimnion	Nitrogen, Ammonia	0.052	mg/L
Pine	13-Jul-99	Lab	epilimnion	Nitrogen, Nitrate+Nitrite	0.022	mg/L
Pine	13-Jul-99	Lab	epilimnion	Phosphorus, (Applicable to all forms)	0.01	mg/L
Pine	13-Jul-99	Lab	epilimnion	Phosphorus, ortho (Dissolved)	0.009	mg/L
Pine	13-Jul-99	Lab	epilimnion	TKN	0.605	mg/L
Pine	13-Jul-99	Lab	hypolimnion	Alkalinity (as CaCO3)	98.5	mg/L
Pine	13-Jul-99	Lab	hypolimnion	Nitrogen, Ammonia	0.692	mg/L
Pine	13-Jul-99	Lab	hypolimnion	Nitrogen, Nitrate+Nitrite	0.022	mg/L
Pine	13-Jul-99	Lab	hypolimnion	Phosphorus, (Applicable to all forms)	0.01	mg/L
Pine	13-Jul-99	Lab	hypolimnion	Phosphorus, ortho (Dissolved)	0.094	mg/L
Pine	13-Jul-99	Lab	hypolimnion	TKN	0.92	mg/L

Exhibit 6

HISTORIC PINE LAKE WATER QUALITY DATA

Source: Indiana Department of Environmental Management

STREAMNAME	SAMPLEDATE	FIELDLABDATATYPE	XSAMPLEDEPTH	Parameter	Result	Units
Clear (LaPorte)	18-Jul-95	Field	1.0 meters	DO	9.6	mg/L
Clear (LaPorte)	18-Jul-95	Field	1.0 meters	Light Trans @ 3 ft.	55	%T
Clear (LaPorte)	18-Jul-95	Field	1.0 meters	Temperature	28.2	°C
Clear (LaPorte)	18-Jul-95	Field	1.5 meters	% Sat	127.7	%
Clear (LaPorte)	18-Jul-95	Field	1.5 meters	DO	10	mg/L
Clear (LaPorte)	18-Jul-95	Field	1.5 meters	Temperature	28.2	°C
Clear (LaPorte)	18-Jul-95	Field	2.0 meters	DO	10.2	mg/L
Clear (LaPorte)	18-Jul-95	Field	2.0 meters	Temperature	27.8	°C
Clear (LaPorte)	18-Jul-95	Field	3.0 meters	DO	0.9	mg/L
Clear (LaPorte)	18-Jul-95	Field	3.0 meters	Temperature	24.5	°C
Clear (LaPorte)	18-Jul-95	Field	epilimnion	pH	8.6	SU
Clear (LaPorte)	18-Jul-95	Field	epilimnion	Specific Conductance (Field)	880	umho/cm
Clear (LaPorte)	18-Jul-95	Field	hypolimnion	pH	8.7	SU
Clear (LaPorte)	18-Jul-95	Field	hypolimnion	Specific Conductance (Field)	900	umho/cm
Clear (LaPorte)	18-Jul-95	Field	surface	% Water Column Oxic	100	%
Clear (LaPorte)	18-Jul-95	Field	surface	1% Light Level	11.8	feet
Clear (LaPorte)	18-Jul-95	Field	surface	DO	9.4	mg/L
Clear (LaPorte)	18-Jul-95	Field	surface	Secchi Depth	2	meters
Clear (LaPorte)	18-Jul-95	Field	surface	Temperature	28	°C
Clear (LaPorte)	18-Jul-95	Lab		Blue-Green Algae	1503	
Clear (LaPorte)	18-Jul-95	Lab		Diatoms	421	
Clear (LaPorte)	18-Jul-95	Lab		Green Algae	195	
Clear (LaPorte)	18-Jul-95	Lab		MicroCrustacea	74	
Clear (LaPorte)	18-Jul-95	Lab		Rotifers	210	
Clear (LaPorte)	18-Jul-95	Lab	epilimnion	Alkalinity (as CaCO3)	47	mg/L
Clear (LaPorte)	18-Jul-95	Lab	epilimnion	Chlorophyll a	4.92	ug/L
Clear (LaPorte)	18-Jul-95	Lab	epilimnion	Nitrogen, Ammonia	0.018	mg/L
Clear (LaPorte)	18-Jul-95	Lab	epilimnion	Nitrogen, Nitrate+Nitrite	0.038	mg/L
Clear (LaPorte)	18-Jul-95	Lab	epilimnion	Phosphorus, (Applicable to all forms)	0.036	mg/L
Clear (LaPorte)	18-Jul-95	Lab	epilimnion	Phosphorus, ortho (Dissolved)	0.008	mg/L
Clear (LaPorte)	18-Jul-95	Lab	epilimnion	TKN	0.628	mg/L
Clear (LaPorte)	18-Jul-95	Lab	hypolimnion	Alkalinity (as CaCO3)	51.5	mg/L
Clear (LaPorte)	18-Jul-95	Lab	hypolimnion	Nitrogen, Ammonia	0.018	mg/L
Clear (LaPorte)	18-Jul-95	Lab	hypolimnion	Nitrogen, Nitrate+Nitrite	0.022	mg/L
Clear (LaPorte)	18-Jul-95	Lab	hypolimnion	Phosphorus, (Applicable to all forms)	0.035	mg/L
Clear (LaPorte)	18-Jul-95	Lab	hypolimnion	Phosphorus, ortho (Dissolved)	0.005	mg/L
Clear (LaPorte)	18-Jul-95	Lab	hypolimnion	TKN	0.624	mg/L
Clear (LaPorte)	13-Jul-99	Field	1.0 meters	DO	11.9	mg/L
Clear (LaPorte)	13-Jul-99	Field	1.0 meters	Light Trans @ 3 ft.	38	%T
Clear (LaPorte)	13-Jul-99	Field	1.0 meters	Temperature	24.5	°C
Clear (LaPorte)	13-Jul-99	Field	1.5 meters	% Sat	78	%
Clear (LaPorte)	13-Jul-99	Field	1.5 meters	DO	6.6	mg/L
Clear (LaPorte)	13-Jul-99	Field	1.5 meters	Temperature	24	°C
Clear (LaPorte)	13-Jul-99	Field	2.0 meters	DO	5.8	mg/L
Clear (LaPorte)	13-Jul-99	Field	2.0 meters	Temperature	24	°C
Clear (LaPorte)	13-Jul-99	Field	3.0 meters	DO	1	mg/L
Clear (LaPorte)	13-Jul-99	Field	3.0 meters	Temperature	23.5	°C
Clear (LaPorte)	13-Jul-99	Field	epilimnion	pH	9.9	SU
Clear (LaPorte)	13-Jul-99	Field	epilimnion	Specific Conductance (Field)	370	umho/cm
Clear (LaPorte)	13-Jul-99	Field	hypolimnion	pH	0	SU
Clear (LaPorte)	13-Jul-99	Field	surface	% Water Column Oxic	100	%
Clear (LaPorte)	13-Jul-99	Field	surface	1% Light Level	10	feet
Clear (LaPorte)	13-Jul-99	Field	surface	DO	11	mg/L
Clear (LaPorte)	13-Jul-99	Field	surface	Secchi Depth	2	meters
Clear (LaPorte)	13-Jul-99	Field	surface	Temperature	25	°C
Clear (LaPorte)	13-Jul-99	Lab		Blue-Green Algae	139	
Clear (LaPorte)	13-Jul-99	Lab		Diatoms	38	
Clear (LaPorte)	13-Jul-99	Lab		Green Algae	13	
Clear (LaPorte)	13-Jul-99	Lab		MicroCrustacea	20	
Clear (LaPorte)	13-Jul-99	Lab		Rotifers	25	
Clear (LaPorte)	13-Jul-99	Lab	epilimnion	Alkalinity (as CaCO3)	52.5	mg/L
Clear (LaPorte)	13-Jul-99	Lab	epilimnion	Chlorophyll a	2.98	ug/L
Clear (LaPorte)	13-Jul-99	Lab	epilimnion	Nitrogen, Ammonia	0.063	mg/L
Clear (LaPorte)	13-Jul-99	Lab	epilimnion	Nitrogen, Nitrate+Nitrite	0.022	mg/L
Clear (LaPorte)	13-Jul-99	Lab	epilimnion	Phosphorus, (Applicable to all forms)	0.045	mg/L
Clear (LaPorte)	13-Jul-99	Lab	epilimnion	Phosphorus, ortho (Dissolved)	0.014	mg/L
Clear (LaPorte)	13-Jul-99	Lab	epilimnion	TKN	0.84	mg/L

Exhibit 7

HISTORIC CLEAR LAKE WATER QUALITY DATA

Source: Indiana Department of Environmental Management

	Clear Lake		Harris Lake		Lily Lake		Pine Lake		Stone Lake	
Index Metric	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
I. Total Phosphorus	0.05 mg/L	2	0.14 mg/L	3	0.07 mg/L	3	0.11 mg/L	3	0.06 mg/L	3
II. Soluble Phosphorus	0.03 mg/L	1	0.06 mg/L	3	0.05 mg/L	2	0.08 mg/L	3	0.04 mg/L	2
III. Organic Nitrogen	0.9 mg/L	3	2.0 mg/L	4	3.2 mg/L	4	1.2 mg/L	3	0.9 mg/L	3
IV. Nitrate-Nitrite	0.1 mg/L	0	0.02 mg/L	0	0.1 mg/L	0	<0.02 mg/L	0	0.02 mg/L	0
V. Ammonia	0.03 mg/L	0	0.02 mg/L	0	1.6 mg/L	4	0.4 mg/L	2	0.2 mg/L	0
VI. DO (% saturation at 5-foot depth)	45%	0	----	----	79%	0	84%	0	90%	0
VII. DO (% of measured water column with > 0.1 ppm)	97%	0	75%	1	91%	0	62%	1	62%	1
VIII. Light Penetration (by Secchi Disk)	2.0 m	0	0.6 m	6	0.8 m	6	4.5 m	0	5.1 m	0
IX. Light Transmission (% light transmission at 3 ft)	10 %	4	0%	4	3%	4	29%	4	28%	4
X. Total Plankton (a single vertical tow between 1% light level and the surface)	13,279 /L	2	42,034 /L	5	33,554 /L	4	3,141 /L	1	3,027 /L	1
- blue-green dominance ?	No	0	No	0	No	0	No	0	No	0
Indiana Trophic State Index		12		26		27		17		14

Exhibit 8

INDIANA TROPHIC STATE INDICES

Parameter	pH	Conductivity	Secchi	TSS	_%_Light_3ft	_1%_light_depth	Phosphorus	O-Phosphate	Ammonia N	Organic_N	Nitrate_Nitrite	DOSat@5ft	%Water_Col_Oxic	Chlorophyll_	Plankton_density	_%_Cyanophyt
Conductivity	0.814															
	0.048															
Secchi	-0.082	-0.469														
	0.895	0.425														
TSS	-0.747	-0.435	-0.538													
	0.088	0.389	0.35													
_%_Light_3ft	-0.066	-0.431	0.991	-0.588												
	0.915	0.469	0.001	0.297												
_1%_light_depth	0.053	-0.456	0.989	-0.593	0.983											
	0.921	0.363	0.001	0.215	0.003											
Phosphorus	-0.196	-0.425	-0.229	0.207	-0.215	0.139										
	0.709	0.401	0.711	0.694	0.728	0.793										
O-Phosphate	-0.03	-0.326	0.149	-0.201	0.227	0.421	0.882									
	0.955	0.528	0.811	0.703	0.713	0.406	0.02									
Ammonia N	0.24	0.403	-0.338	-0.374	-0.263	-0.099	0.047	0.28								
	0.647	0.428	0.578	0.465	0.669	0.851	0.93	0.59								
Organic_N	-0.184	0.245	-0.726	0.285	-0.679	-0.602	0.097	0.056	0.771							
	0.727	0.64	0.165	0.583	0.207	0.206	0.854	0.916	0.072							
Nitrate_Nitrite	0.478	0.877	-0.565	-0.12	-0.538	-0.662	-0.685	-0.663	0.324	0.388						
	0.337	0.022	0.321	0.821	0.35	0.152	0.133	0.152	0.53	0.447						
DOSat@5ft	-0.951	-0.811	0.507	0.641	0.53	0.647	0.499	0.539	0.311	0.201	-0.696					
	0.049	0.189	0.493	0.359	0.47	0.353	0.501	0.461	0.689	0.799	0.304					
%Water_Col_Oxic	0.867	0.777	0.141	-0.907	0.195	0.101	-0.872	-0.446	0.446	-0.021	0.715	-0.793				
	0.057	0.122	0.821	0.034	0.754	0.871	0.054	0.452	0.452	0.973	0.174	0.207				
Chlorophyll_	-0.271	-0.423	-0.218	0.344	-0.31	0.051	0.508	0.261	0.107	0.252	-0.437	0.625	-0.661			
	0.603	0.404	0.725	0.504	0.612	0.923	0.304	0.618	0.84	0.63	0.386	0.375	0.225			
Plankton_density	-0.343	0.106	-0.928	0.759	-0.938	-0.877	0.178	-0.156	0.21	0.764	0.322	-0.182	-0.441	0.362		
	0.506	0.842	0.023	0.08	0.018	0.022	0.736	0.768	0.69	0.077	0.533	0.818	0.457	0.481		
_%_Cyanophyt	0.215	0.126	0.168	-0.597	0.22	0.389	0.036	0.364	0.864	0.43	-0.002	0.748	0.467	0.207	-0.207	
	0.683	0.811	0.787	0.211	0.722	0.446	0.945	0.478	0.027	0.394	0.997	0.252	0.428	0.694	0.693	
Eutr_Index	-0.509	-0.086	-0.714	0.619	-0.686	-0.605	0.559	0.373	0.574	0.913	0.055	0.365	-0.423	0.513	0.868	0.261
	0.381	0.891	0.176	0.265	0.201	0.279	0.327	0.537	0.312	0.03	0.93	0.635	0.478	0.377	0.056	0.672

Exhibit 9

CORRELATION MATRIX OF ITSI METRICS

Pearson correlation coefficients and P-values

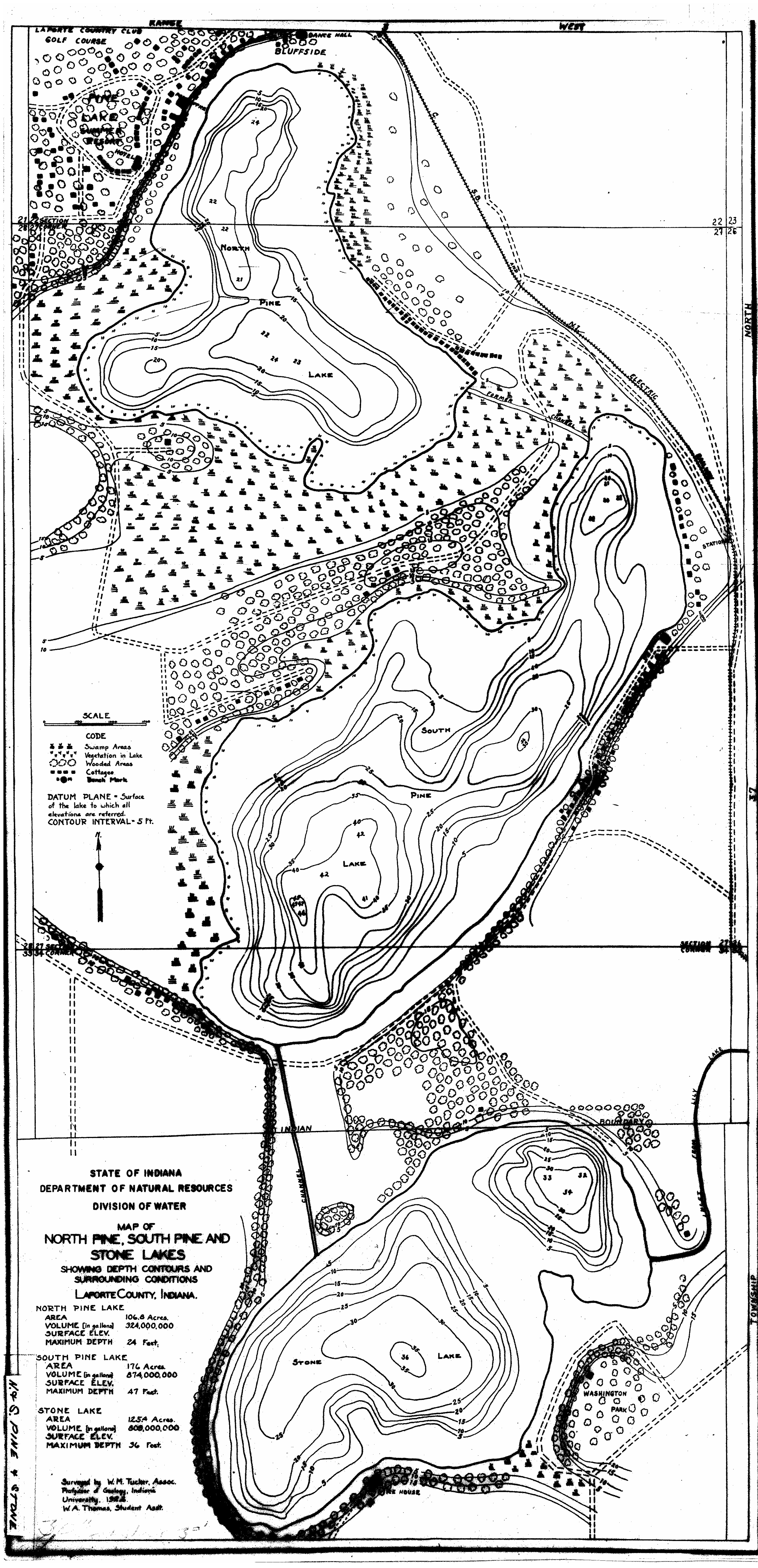


Exhibit 10

1922 DNR MAP OF PINE AND STONE LAKES

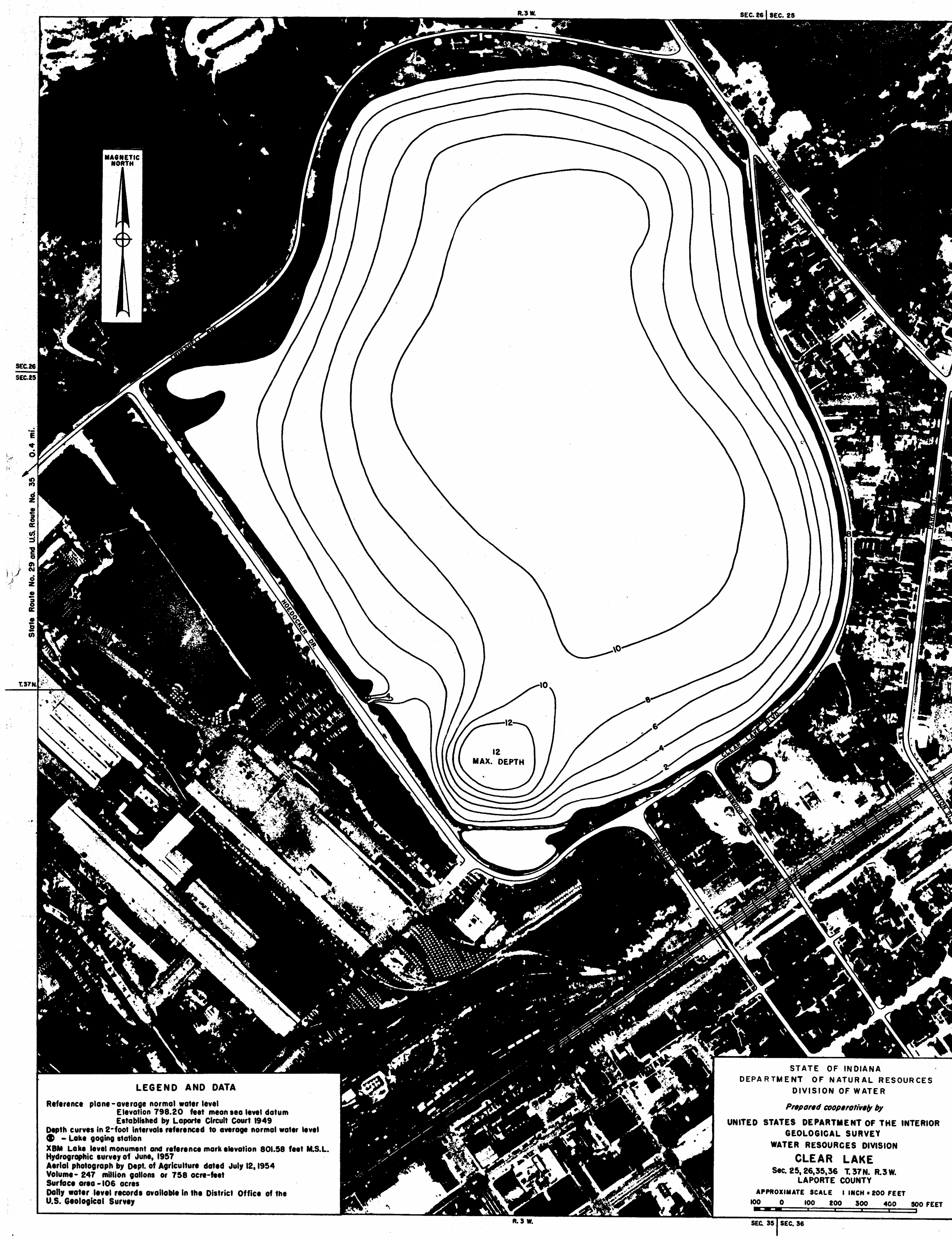


Exhibit 11

1957 DNR MAP OF CLEAR LAKE

Lily Lake

Species	Abundance (per L)
Blue-Green Algae (Cyanophyta)	
Microcystis	10451
Oscillatoria	3314
Green Algae (Chlorophyta)	
Pediastrum	1301
Ulothrix	1507
Chrysophyta (Golden algae)	
Diatoms (Bacillariophyceae)	
Fragilaria	
Stephanodiscus	616
Miscellaneous Algae	
Colonial	2987
Dinoflagellates (Pyrrophyta)	
Ceratium	2315
Zooplankton	
Keratella	479
Protists	1972
Rotifers	630
Cladocerans	4629
Copepods	2150
Nauplii	1192
Total	33543
Total Blue-greens	13765
Percent Blue-greens	41

Pine Lake

Species	Abundance (per L)
Blue-Green Algae (Cyanophyta)	
Anaebaena	276
Microcystis	165
Oscillatoria	138
Woronchinia	96
Green Algae (Chlorophyta)	
Oedogonium	110
Pediastrum	165
Ulothrix	124
Chrysophyta (Golden algae)	
Diatoms (Bacillariophyceae)	
Fragilaria	179
Stephanodiscus	179
Other Chrysophyta	
Dinobryon	69
Miscellaneous Algae	
colonial algae	372
Dinoflagellates (Pyrrophyta)	
Ceratium	661
Zooplankton	
Keratella	124
Protists	358
Rotifers	124
Total	3140
Total Blue-greens	675
Percent Blue-greens	21.5

Stone Lake

Species	Abundance (per L)
Blue-Green Algae (Cyanophyta)	
Anaebaena	131
Microcystis	620
Oscillatoria	48
Woronchinia	12
Green Algae (Chlorophyta)	
Oedogonium	
Pediastrum	24
Ulothrix	0
Chrysophyta (Golden algae)	
Diatoms (Bacillariophyceae)	
Fragilaria	286
Stephanodiscus	83
Other Chrysophyta	
Dinobryon	
Miscellaneous Algae	
colonial algae	501
Dinoflagellates (Pyrrophyta)	
Ceratium	989
Zooplankton	
Keratella	48
Protists	167
Copepods	0
Cladocerans	24
Nauplii	0
Rotifers	95
Total	3028
Total Blue-greens	811
Percent Blue-greens	26.8

Harris Lake

Species	Abundance (per L)
Blue-Green Algae (Cyanophyta)	
Anaebaena	0
Microcystis	0
Oscillatoria	787
Woronchinia	0
Green Algae (Chlorophyta)	
Pediastrum	472
Scenedesmus	630
Ulothrix	0
Chrysophyta (Golden algae)	
Diatoms (Bacillariophyceae)	
Actinastrum	0
Asterionella	0
Fragilaria	1417
Stephanodiscus	0
Miscellaneous Algae	
colonial algae	6927
Dinoflagellates (Pyrrophyta)	
Ceratium	0
Zooplankton	
Keratella	0
Protists	29912
Copepods	315
Cladocerans	157
Nauplii	1102
Rotifers	315
Total	42034
Total Blue-greens	787
Percent Blue-greens	1.9

Clear Lake

Species	Abundance (per L)
Blue-Green Algae (Cyanophyta)	
Anaebaena	0
Microcystis	0
Oscillatoria	787
Woronchinia	0
Green Algae (Chlorophyta)	
Scenedesmus	1179
Pediastrum	205
Ulothrix	0
Chrysophyta (Golden algae)	
Diatoms (Bacillariophyceae)	
Actinastrum	0
Asterionella	103
Fragilaria	1179
Stephanodiscus	0
Miscellaneous Algae	
colonial algae	3948
Dinoflagellates (Pyrrophyta)	
Ceratium	359
Zooplankton	
Keratella	154
Protists	3589
Copepods	356
Cladocerans	359
Nauplii	410
Rotifers	308
Total	12936
Total Blue-greens	787
Percent Blue-greens	6.1

Lower Lake

Species	Abundance (per L)
Blue-Green Algae (Cyanophyta)	
Anaebaena	0
Microcystis	0
Oscillatoria	880
Woronchinia	0
Green Algae (Chlorophyta)	
Pediastrum	440
Scenedesmus	880
Ulothrix	0
Chrysophyta (Golden algae)	
Diatoms (Bacillariophyceae)	
Asterionella	0
Actinastrum	440
Fragilaria	440
Stephanodiscus	440
Miscellaneous Algae	
filamentous algae	7923
colonial algae	3961
Dinoflagellates (Pyrrophyta)	
Ceratium	0
Zooplankton	
Keratella	0
Protists	2641
Copepods	0
Cladocerans	9683
Nauplii	440
Rotifers	0
Total	28168
Total Blue-greens	880
Percent Blue-greens	3.1

Exhibit 12

PLANKTON IDENTIFICATION AND ENUMERATION DATA

Lake	Total plankton	Total algae	Total blue-greens	% total plankton blue-greens	% total plankton phytoplankton	% total plankton zooplankton	% total phytoplankton blue-greens
Harris	42034	10233	787	1.9	24.3	75.7	7.7
Lily	33543	22491	13765	41	67	33	61.2
Lower	28168	15404	880	3.1	54.7	45.3	5.7
Clear	12936	7760	787	6.1	60	40	10.1
Pine	3140	2534	675	21.5	80.7	19.3	26.6
Stone	3028	2694	811	26.8	89	11	30

Exhibit 13

SUMMARY OF PLANKTON ANALYSES

Lake Surface Area (Acres)	Number of Randomly Collected Vegetation Samples According to Lake Trophic State and Area												
		Eutrophic Depth Contours (ft)			Mesotrophic Depth Contours (ft)				Oligotrophic Depth Contours (ft)				
	Total	0-5	5-10	10-15	0-5	5-10	10-15	15-20	0-5	5-10	10-15	15-20	20-25
<10	20	10	7	3	10	5	3	2	10	4	3	2	1
10-49	30	10	10	10	10	10	7	3	10	10	5	3	2
50-99	40	17	13	10	10	10	10	10	10	10	10	7	3
100-199	50	23	17	10	14	14	12	10	10	10	10	10	10
200-299	60	30	20	10	18	16	16	10	14	12	12	12	10
300-399	70	37	23	10	22	20	18	10	17	15	14	14	10
400-499	80	43	27	10	25	25	22	10	19	18	17	16	10
500-799	90	50	30	10	29	27	24	10	22	21	19	18	10
≥800	100	57	33	10	33	31	26	10	25	23	22	20	10

The number of samples is based on lake surface area and trophic state, in which samples are distributed by depth class, taken from proposed LARE Tier II protocol (C. Rich, pers. comm.)

Exhibit 14

PROTOCOL FOR THE NUMBER OF SAMPLES FOR THE DETERMINATION OF AQUATIC MACROPHYTE DENSITY

Species Name	*C* Value*	Common Name	Family Name	Species Code
Bidens beckii Torr. ex Spreng.	10	Water marigold	Asteraceae	BIDBEC
Bidens cernua		Nodding beggars-ticks	Asteraceae	
Brasenia schreberi J. F. Gmel.	4	Water shield	Braseniaceae	BRASCH
Cephalanthus occidentalis L.	5	Buttonbush	Rubiaceae	CEPOCC
Ceratophyllum demersum L.	1	Common coontail	Ceratophyllaceae	CERDEM
Chara braunii C. C. Gmel.		Braun's muskgrass	Characeae	CHABRA
Chara contraria A. Braun ex Kütz.		Opposite muskgrass		CHACON
Chara foliolosa Muhl. ex Willd.		Small-leaved muskgrass		CHAFOL
Chara globularis Thuill.		Fragile muskgrass		CHAGLO
Chara zeylanica Klein ex Willd		Ceylonian muskgrass		CHAZEY
Cyperus bipartitus Torr.	3	Slender flatsedge	Cyperaceae	CYPBIP
Cyperus odoratus L.	1	Fragrant flatsedge		CYPODO
Eleocharis obtusa (Willd.) Schult.	1	Blunt spikerush		ELEOBT
Decodon verticillatus (L.) Elliott	8	Swamp loosestrife	Lythraceae	DECVER
Elodea canadensis Michx.	3	Canada waterweed	Hydrocharitaceae	ELOCAN
Heteranthera dubia (Jacq.) MacMill.	5	Water starwort	Pontederiaceae	HETDUB
Juncus effusus L.	3	Common rush	Juncaceae	JUNEFF
Lemna minor L.	3	Lesser duckweed	Lemnaceae	LEMMIN
Lemna trisulca L.	6	Star duckweed		LEMTRI
Lythrum salicaria L.	-	Purple loosestrife	Lythraceae	LYTSAL
Myriophyllum heterophyllum Michx.	7	Variable-leaf water milfoil	Haloragaceae	MYRHET
Myriophyllum sibiricum Kom.	7	Northern water-milfoil		MYRSIB
Myriophyllum spicatum L.	-	Eurasian water-milfoil		MYRSPI
Myriophyllum tenellum Bigelow	10	Slender water-milfoil		MYRTEN
Najas flexilis (Willd.) Rostk. & Schmidt	5	Slender water naiad	Najadaceae	NAJFLE
Najas minor All.	-	Minor naiad		NAJMIN
Nelumbo lutea Willd.	4	Water lotus	Nymphaeaceae	NELLUT
Nitella flexilis C. Agardh		Smooth stonewort	Characeae	NITFLE
Nitella tenuissima (Desv.) Kűtz		Dwarf stonewort		NITTEN
Nuphar advena (Aiton) W. T. Aiton	6	Spatterdock	Nymphaeaceae	NUPADV
Nymphaea odorata subsp. *tuberosa* (Paine)	6	White water lily		NYMODO
Peltandra virginica (L.) Schott	6	Arrow arum	Araceae	PELVIR
Pontederia cordata L.	5	Pickerelweed	Pontederiaceae	PONCOR
Potamogeton amplifolius Tuck.	10	Big-leaf pondweed	Potamogetonaceae	POTAMP
Potamogeton crispus L.	-	Curly leaf pondweed		POTCRI
Potamogeton foliosus Raf. subsp. *Foliosus*	4	Leafy pondweed		POTFOL
Potamogeton friesii Rupr.	10	Leafy pondweed		POTFRI
Potamogeton gramineus L.	7	Variable-leaf pondweed		POTGRA
Potamogeton illinoensis Morong	7	Illinois pondweed		POTILL
Potamogeton natans L.	8	Floating-leaved pondweed		POTNAT
Potamogeton nodosus Poir.	4	Long-leaf pondweed		POTNOD
Potamogeton pusillus L. subsp.*tenuissimus*	4	Small pondweed		POTPUS
Potamogeton praelongus Wulfen	10	White-stem pondweed		POTPRA
Potamogeton robbinsii Oakes	10	Fern pondweed		POTROB
Potamogeton strictifolius A. Benn.	10	Stiff pondweed		POTSTR
Potamogeton zosteriformis Fernald	8	Flatstem pondweed		POTZOS
Ranunculus aquatilis L. var. *diffusus* With.	7	White water-crowfoot	Ranunculaceae	RANAQU
Sagittaria graminea Michx. subsp. *Graminea*	9	Grass-leaved arrowhead	Alismataceae	SAGGRA
Sagittaria latifolia Willd.	3	Duck potato		SAGLAT
Sagittaria rigida Pursh	10	Sessile-fruited arrowhead		SAGRIG
Sparganium sp.	-	Bur-reed	Sparganiaceae	SPA
Spirodela polyrrhiza (L.) Schleid.	5	Large duckweed	Lemnaceae	SPIPOL
Stuckenia pectinata (L.) Börner	3	Sago pondweed	Potamogetonaceae	STUPEC
Typha latifolia L.	1	Common cattail	Typhaceae	TYPLAT
Utricularia gibba	4	Humped bladderwort	Lentibulariaceae	UTRGIB
Utricularia macrorhiza LeConte	5	Common bladderwort		UTRMAC
Vallisneria americana Michx.	7	Eelgrass, tapegrass	Hydrocharitaceae	VALAME
Wolffia brasiliensis Wedd.	6	Brazilian watermeal	Lemnaceae	WOLBRA
Wolffia columbiana L.	5	Columbian watermeal		WOLCOL

* Values from Rothrock, P. E. 2004. Floristic Quality Assessment in Indiana: The Concept, Use, and Development of Coefficients of Conservatism. Final Report, EPA Wetland Program Development Grant. All other values from Alix and Scribailo (in preparation).

Exhibit 15

LIST OF AQUATIC PLANTS FOUND IN LA PORTE'S LAKES

Stone Lake, LaPorte Co.

Bidens beckii Torr. ex Spreng.
Bidens cernua
Brasenia schreberi J. F. Gmel.
Ceratophyllum demersum L.
Chara foliolosa Muhl. ex Willd.
Chara globularis Thuill.
Elodea canadensis Michx.
Heteranthera dubia (Jacq.) MacMill.
Lemna minor L.
Lemna trisulca L.
Lythrum salicaria L.
Myriophyllum sibiricum Kom.
Myriophyllum spicatum L.
Najas flexilis (Willd.) Rostk. & Schmidt
Nitella flexilis C. Agardh
Nuphar advena (Aiton) W. T. Aiton
Nymphaea odorata subsp. *tuberosa* (Paine) Wiersema & Hellq.
Pontederia cordata L.
Potamogeton amplifolius Tuck.
Potamogeton crispus L.
Potamogeton friesii Rupr.
Potamogeton gramineus L.
Potamogeton natans L.
Potamogeton praelongus Wulfen
Potamogeton pusillus L. subsp. *pusillus*
Potamogeton robbinsii Oakes
Potamogeton strictifolius A. Benn.
Potamogeton zosteriformis Fernald
Ranunculus aquatilis L. var. *diffusus* With.
Sagittaria graminea Michx. subsp. *graminea*
Sagittaria rigida Pursh
Spirodela polyrrhiza (L.) Schleid.
Stuckenia pectinata (L.) Börner
Utricularia macrorhiza LeConte
Vallisneria americana Michx.

Lily Lake, LaPorte Co.

Cephalanthus occidentalis L.
Ceratophyllum demersum L.
Cyperus odoratus L.
Decodon verticillatus (L.) Elliott
Heteranthera dubia (Jacq.) MacMill.
Lemna minor L.
Lythrum salicaria L.
Myriophyllum spicatum L.
Najas flexilis (Willd.) Rostk. & Schmidt
Najas minor All.
Nuphar advena (Aiton) W. T. Aiton
Nymphaea odorata subsp. *tuberosa* (Paine) Wiersema & Hellq.
Spirodela polyrrhiza (L.) Schleid.
Typha latifolia L.
Utricularia gibba L.
Utricularia macrorhiza LeConte

Harris Lake, LaPorte Co.

Alisma subcordatum Raf.
Ceratophyllum demersum L.
Cyperus odoratus L.
Elodea canadensis Michx.
Juncus effusus L.
Lemna minor L.
Lemna trisulca L.
Lythrum salicaria L.
Najas flexilis (Willd.) Rostk. & Schmidt
Nitella flexilis C. Agardh
Nuphar advena (Aiton) W. T. Aiton
Nymphaea odorata subsp. *tuberosa* (Paine) Wiersema & Hellq.
Pontederia cordata L.
Potamogeton foliosus Raf. subsp. *foliosus*
Potamogeton pusillus L.
Potamogeton zosteriformis Fernald
Ranunculus aquatilis L. var. *diffusus* With.
Sagittaria rigida Pursh
Sparganium sp.
Spirodela polyrrhiza (L.) Schleid.
Typha latifolia L.
Utricularia macrorhiza LeConte
Wolffia brasiliensis Wedd.
Wolffia columbiana H. Karst.

Pine Lake, LaPorte Co.

Bidens beckii Torr. ex Spreng.
Brasenia schreberi J. F. Gmel.
Ceratophyllum demersum L.
Chara contraria A. Braun ex Kütz.
Chara foliolosa Muhl. ex Willd.
Chara globularis Thuill.
Chara zeylanica Klein ex Willd
Decodon verticillatus (L.) Elliott
Elodea canadensis Michx.
Heteranthera dubia (Jacq.) MacMill.
Lemna minor L.
Lemna trisulca L.
Lythrum salicaria L.
Myriophyllum heterophyllum Michx.
Myriophyllum sibiricum Kom.
Myriophyllum spicatum L.
Myriophyllum tenellum Bigelow
Najas flexilis (Willd.) Rostk. & Schmidt
Nitella tenuissima (Desv.) Kűtz
Nuphar advena (Aiton) W. T. Aiton
Nymphaea odorata subsp. *tuberosa* (Paine) Wiersema & Hellq.
Peltandra virginica (L.) Schott
Phragmites communis
Pontederia cordata L.
Potamogeton amplifolius Tuck.
Potamogeton crispus L.
Potamogeton friesii Rupr.
Potamogeton gramineus L.
Potamogeton illinoensis Morong
Potamogeton praelongus Wulfen
Potamogeton robbinsii Oakes
Potamogeton zosteriformis Fernald
Ranunculus aquatilis L. var. *diffusus* With.
Sagittaria graminea Michx. subsp. *graminea*
Sagittaria latifolia Willd.
Spirodela polyrrhiza (L.) Schleid.
Stuckenia pectinata (L.) Börner
Utricularia macrorhiza LeConte
Vallisneria americana Michx.
Wolffia columbiana H. Karst.

Exhibit 16

LISTS OF AQUATIC PLANTS FOUND IN STONE, LILY, HARRIS, AND PINE LAKES

Clear Lake, La Porte Co.

Ceratophyllum demersum L.
Chara braunii C. C. Gmel.
Elodea canadensis Michx.
Heteranthera dubia (Jacq.) MacMill.
Lemna minor L.
Lythrum salicaria L.
Myriophyllum spicatum L.
Najas flexilis (Willd.) Rostk. & Schmidt
Najas minor All.
Nelumbo lutea Willd.
Nuphar advena (Aiton) W. T. Aiton
Nymphaea odorata subsp. *tuberosa* (Paine) Wiersema & Hellq.
Pontederia cordata L.
Potamogeton crispus L.
Potamogeton illinoensis Morong
Potamogeton nodosus Poir.
Potamogeton pusillus L. subsp.*tenuissimus* (Mert. & Koch) R. R. Haynes & Hellq.
Potamogeton zosteriformis Fernald
Ranunculus aquatilis L. var. *diffusus* With.
Sagittaria rigida Pursh
Spirodela polyrrhiza (L.) Schleid.
Stuckenia pectinata (L.) Börner
Typha latifolia L.
Vallisneria americana Michx.
Wolffia brasiliensis Wedd.
Wolffia columbiana L.

Lower Lake, LaPorte Co.

Alisma subcordatum Raf.
Ceratophyllum demersum L.
Cyperus bipartitus Torr.
Cyperus odoratus L.
Eleocharis obtusa (Willd.) Schult.
Lemna minor L.
Nitella flexilis C. Agardh
Nuphar advena (Aiton) W. T. Aiton
Nymphaea odorata subsp. *tuberosa* (Paine) Wiersema & Hellq.
Pontederia cordata L.
Potamogeton foliosus Raf. subsp. *Foliosus*
Potamogeton natans L.
Sagittaria sp.
Sparganium sp.
Spirodela polyrrhiza (L.) Schleid.
Typha latifolia L.
Utricularia gibba L.
Utricularia macrorhiza LeConte
Wolffia columbiana H. Karst.

Exhibit 17

LISTS OF AQUATIC PLANTS FOUND IN CLEAR AND LOWER LAKES

TYPE	SPECIES NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	TOWNSHIIP RANGE SECTION	LAST OBS	COMMENTS
Bird	*Ixobrychus exilis*	Least Bittern		SE	037N003W 25	6/9/1986	
Mammal	*Taxidea taxus*	American Badger			037N003W 28	1990-FA	
Reptile	*Clemmys guttata*	Spotted Turtle		SE	037N003W LaPorte Area	6/20/1907	
LILY LAKE							
Bird	*Chlidonias niger*	Black Tern		SE	037N003W 35 W1/2	1960S	NESTING
Mollusk Gastropod	*Lymnaea stagnalis*	Swamp Lymnaea		SSC	037N003W 35 W1/2	1987	
Reptile	*Liochlorophis vernalis*	Smooth Green Snake		SE	037N003W 35 W1/2	1960s	
Reptile	*Sistrurus catenatus catenatus*	Eastern Massasauga	C	SE	037N003W 35 W1/2	1930	
Vascular Plant	*Potamogeton friesii*	Fries' Pondweed		ST	037N003W 35 SEQ NWQ	7/6/1985	
Vascular Plant	*Potamogeton pusillus*	Slender Pondweed		WL	037N003W 35 SEQ NWQ	7/6/1985	
Vascular Plant	*Sparganium androcladum*	Branching Bur-reed		ST	037N003W 35 W1/2	10/2/1987	
PINE LAKE							
Fish	*Acipenser fulvescens*	Lake Sturgeon		SE	037N003W 28	5/15/1992	
Vascular Plant	*Bidens beckii*	Beck Water-marigold		ST		9/23/2002	
Vascular Plant	*Carex atherodes*	Awned Sedge		SE	037N003W 27 SWQ NWQ	6/29/1980	
Vascular Plant	*Eleocharis melanocarpa*	Black-fruited Spike-rush		ST	037N003W 27 NEQ SWQ NWQ	9/14/1980	
Vascular Plant	*Eleocharis melanocarpa*	Black-fruited Spike-rush		ST	037N003W 27 SWQ	9/25/1980	
Vascular Plant	*Juncus pelocarpus*	Brown-fruited Rush		SE	037N003W 27 NEQ SWQ NWQ	9/14/1980	
Vascular Plant	*Potamogeton robbinsii*	Flatleaf Pondweed		SR	037N003W 27 NEQ SWQ NWQ	7/20/2002	
Vascular Plant	*Potamogeton strictifolius*	Straight-leaf Pondweed		ST	037N003W 27	9/7/2000	
STONE LAKE							
Vascular Plant	*Bidens beckii*	Beck Water-marigold		ST	037N003W 34 SEQ	1998	
Vascular Plant	*Myriophyllum pinnatum*	Cutleaf Water-milfoil		SE	037N003W 34	9/15/2000	
Vascular Plant	*Potamogeton praelongus*	White-stem Pondweed		ST	037N003W 34	9/15/1997	
Vascular Plant	*Potamogeton robbinsii*	Flatleaf Pondweed		SR	037N003W 34 SEQ	7/31/1983	
Vascular Plant	*Potamogeton robbinsii*	Flatleaf Pondweed		SR	037N003W 34	9/15/1997	

Fed: LE = listed federal endangered; C = federal candidate species
State: SE = state endangered; ST = state threatened; SR = state rare; SSC = state species of special concern; SG = state significant; WL= watch list; no rank = not ranked but tracked to monitor status

Exhibit 18

STATE ENDANGERED, THREATENED AND RARE SPECIES IN THE STUDY AREA

APPENDICES

LIST OF APPENDICES

APPENDIX A

ANALYSIS OF LONG TERM LAKE LEVEL AND PRECIPITATION DATA

This objective of this analysis was to assess the influence of precipitation and groundwater elevation on La Porte's lake water levels. We took an empirical approach to this analysis because long-term data were available from the City on the elevation of Pine Lake.

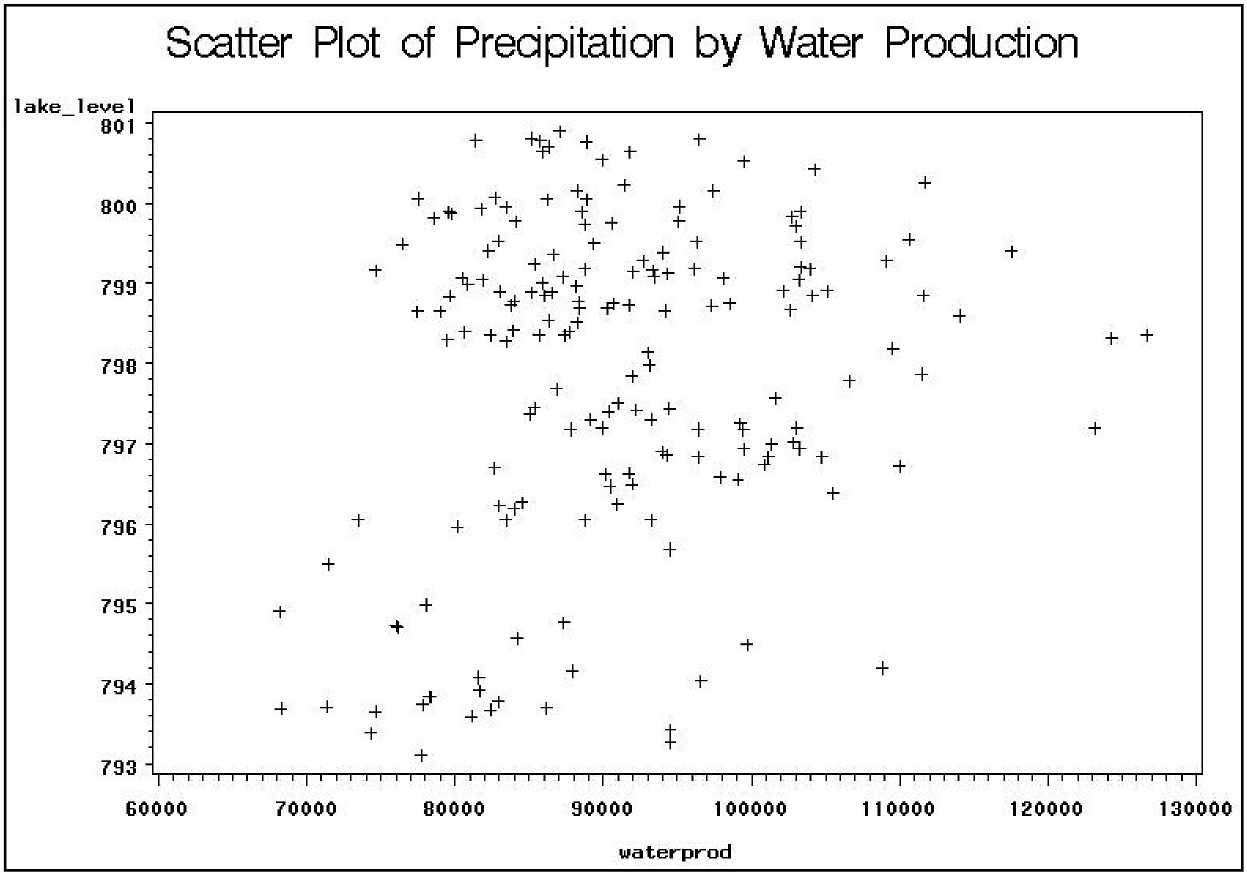
Data were available on monthly lake levels for Pine Lake, generally from 1895 through 2006. Monthly precipitation data were also available from 1948 forward from the State Climatologist. Unfortunately, neither shallow nor deep groundwater elevation data were available. As a surrogate for groundwater table elevation, we utilized water production data from the La Porte Water Department. Monthly water production data were available for the period 1990 to date.

We performed correlation analysis using SAS (Version 8.2, SAS Institute, Cary, NC). Appropriate tests for normal distributions, and transformations as necessary to approximate normal distributions, were performed prior to correlation. Several correlations were performed (SAS output attached) and are summarized below.

Variables in Model	Period of Record	Significant Correlations ($\alpha < 0.05$)
Monthly lake level, monthly water production, and monthly precipitation	1/1990 to 6/2006	Lake level shows a weak positive correlation with water production ($r=0.2134$; $p=0.0042$)
December lake level, log-annual precipitation, annual water production	1/1990 to 6/2006	none
Monthly lake level, monthly precipitation	4/1948 to 7/2006	none
December lake level, annual precipitation	4/1948 to 7/2006	none

Monthly and annual precipitation measurements have little or no association with Pine Lake levels. Our model did not address the possibility of a maximum lake level. It was only in the late 1990s, with the construction of the siphon, that these lakes had an outlet. Without groundwater elevation data, we are unable to find a surrogate indicator. A weak positive correlation with lake level and water production suggests that, during rainy months, water demand in La Porte is higher than dry months.

Figure A-1. Lake Level Versus Water Production.



Correlation Analysis

The CORR Procedure

3 Variables:	lake_level precipitation waterprod

Simple Statistics						
Variable	**N**	**Mean**	**Std Dev**	**Sum**	**Minimum**	**Maximum**
lake_level	178	797.85067	2.04024	142017	793.10000	800.90000
precipitation	198	3.49621	1.92912	692.25000	0.31000	10.13000
waterprod	199	90062	10912	17922269	68172	126727

Pearson Correlation Coefficients
Prob > |r| under H0: Rho=0
Number of Observations

	lake_level	**precipitation**	**waterprod**
lake_level	1.00000 178	-0.03655 0.6291 177	0.21341 0.0042 178
precipitation	-0.03655 0.6291 177	1.00000 198	0.12579 0.0774 198
waterprod	0.21341 0.0042 178	0.12579 0.0774 198	1.00000 199

The SAS System

Obs	Year	Dec_lake_level	Ann_precip	Ann_Water_Prod	ln_Ann_precip
1	1990	798.28	62.21	1131701	4.13052
2	1991	798.69	46.52	1185520	3.83988
3	1992	798.97	46.09	1111386	3.83060
4	1993	800.81	51.63	1087078	3.94410
5	1994	799.95	34.79	1091378	3.54933
6	1995	798.39	37.03	1090191	3.61173
7	1996	799.04	46.31	1040361	3.83536
8	1997	798.65	36.23	1012881	3.58989
9	1998	798.51	35.29	1129016	3.56360
10	1999	797.30	34.94	1179859	3.55363
11	2000	796.26	43.06	1123880	3.76259
12	2001	796.70	46.68	1133575	3.84332
13	2002	796.05	32.37	1090846	3.47723
14	2003	795.50	33.92	993112	3.52400
15	2004	793.69	44.43	934029	3.79391
16	2005	793.10	33.36	1009652	3.50736

Correlation Analysis Using Annual Dataset

The CORR Procedure

3 Variables:	Dec_lake_level In_Ann_precip Ann_Water_Prod

Simple Statistics

Variable	N	Mean	Std Dev	Median	Minimum	Maximum
Dec_lake_level	16	797.49313	2.14236	798.33500	793.10000	800.81000
In_Ann_precip	16	3.70982	0.18832	3.68716	3.47723	4.13052
Ann_Water_Prod	16	1084029	69275	1091112	934029	1185520

Pearson Correlation Coefficients, N = 16
Prob > |r| under H0: Rho=0

	Dec_lake_level	In_Ann_precip	Ann_Water_Prod
Dec_lake_level	1.00000	0.33073 0.2109	0.48990 0.0541
In_Ann_precip	0.33073 0.2109	1.00000	0.22211 0.4084
Ann_Water_Prod	0.48990 0.0541	0.22211 0.4084	1.00000

Spearman Correlation Coefficients, N = 16 Prob > |r| under H0: Rho=0			
	Dec_lake_level	ln_Ann_precip	Ann_Water_Prod
Dec_lake_level	1.00000	0.43235 0.0944	0.25000 0.3504
ln_Ann_precip	0.43235 0.0944	1.00000	0.32941 0.2128
Ann_Water_Prod	0.25000 0.3504	0.32941 0.2128	1.00000

APPENDIX B

PHOSPHORUS LOAD MODELS

Landmark	Receiving Water	Baetis_ID	Acres	Annual Prec	Imperv	Runoff Coef	Fraction	Annual Runoff	P EMC	TSS EMC	P Load (lbs)	P Load (kg)	TSS Load (lb)	TSS Load (kg)
Clear Lake Alum Doser	Clear Lake	1	93.6	41.72	65%	0.63	0.85	22.4	0.095	69	45	20	32762	14861
Kroger Center	Lily Lake	10	35.5		75%	0.73	0.85	25.7	0.145	69	30	14	14217	6449
Wardner Ave	Harris	29	10.1		50%	0.5	0.85	17.7	0.26	100	11	5	4051	1837
Weller Ave	Lily Lake	19	14.4		50%	0.5	0.85	17.7	0.26	100	15	7	5752	2609
Fremont St	Fremont Wetland	24	13.6		30%	0.32	0.85	11.3	0.26	100	9	4	3494	1585
Lakeshore/Greenleaf	Stone Lake	17	6.0		40%	0.41	0.85	14.5	0.26	100	5	2	1988	902
Woodbine	Central Wetland	27	19.7		40%	0.41	0.85	14.5	0.26	100	17	8	6477	2938
Greenleaf	Central Wetland	28	5.6		40%	0.41	0.85	14.5	0.26	100	5	2	1838	834
Craven / Pennsylvania	Craven Pond	25	11.3		35%	0.37	0.85	12.9	0.26	100	9	4	3306	1500
Kosciusko St	Clear Lake	3	2.6		35%	0.37	0.85	12.9	0.26	100	2	1	751	341

Land Use / Cover (in hectares)	Clear Lake	Lower Lake	Pine Lake	Harris Wetland	Stone Lake	Lily Lake
Open Water	52.1	2.6	277.7	10.6	76.6	13.3
Low Intensity Residential	9.0	7.7	129.5	5.7	35.1	12.0
High Intensity Residential	13.5	6.7	24.8	5.4	18.5	25.7
Commercial/Industrial/Transportation	53.8	0.1	25.7	4.5	4.9	45.5
Deciduous Forest	10.1	3.3	385.4	3.3	56.3	7.7
Evergreen Forest	8.7	3.3	257.8	2.2	42.9	5.5
Upland Grasses & Forbs	3.8	0.9	80.6	0.2	4.6	0.3
Pasture/Hay	1.7	1.7	410.6	0.2	17.6	0.1
Row Crops	5.1	1.1	476.6	0.9	76.3	0.0
Urban/Recreational Grasses	7.5	0.5	55.7	0.3	10.9	2.3
Woody Wetlands	2.7	0.5	80.6	2.0	11.9	3.2
Emergent Herbaceous Wetlands	1.5	15.6	80.3	8.7	10.2	7.6
Lake Area (ha)	37.5	14.7	219.9	14.3	60.5	11.3
Runoff Volume (cu m/yr)						
Open Water	0	0	0	0	0	0
Low Intensity Residential	347	298	4994	219	1354	462
High Intensity Residential	794	392	1456	318	1086	1509
Commercial/Industrial/Transportation	3297	6	1572	276	298	2785
Deciduous Forest	62	20	2361	20	345	47
Evergreen Forest	53	20	1579	13	263	34
Upland Grasses & Forbs	23	6	494	1	28	2
Pasture/Hay	35	35	8508	4	366	2
Row Crops	106	22	9876	19	1582	0
Urban/Recreational Grasses	337	20	2510	12	491	105
Woody Wetlands	17	3	494	12	73	19
Emergent Herbaceous Wetlands	9	95	492	53	62	46
Total	5081	918	34336	947	5945	5011
Water Loading (cu m/yr)	6218	1364	41000	1380	7779	5353
Areal Water Loading (m/yr)	1.66	0.93	1.86	0.97	1.29	4.74

Annual Precipitation (m/yr)	1.06
Lake Evaporation (m/yr)	0.76
Net Precipitation (m/yr)	0.30

Imperviousness Estimates	
Low Intensity Residential	42%
High Intensity Residential	67%
Commercial/Industrial/Transportation	70%
Deciduous Forest	2%
Evergreen Forest	2%
Upland Grasses & Forbs	2%
Pasture/Hay	20%
Row Crops	20%
Urban/Recreational Grasses	50%
Woody Wetlands	2%
Emergent Herbaceous Wetlands	2%

Fraction of Storms Producing Runoff	85%

Runoff (m/yr)	
Low Intensity Residential	0.39
High Intensity Residential	0.59
Commercial/Industrial/Transportation	0.61
Deciduous Forest	0.06
Evergreen Forest	0.06
Upland Grasses & Forbs	0.06
Pasture/Hay	0.21
Row Crops	0.21
Urban/Recreational Grasses	0.45
Woody Wetlands	0.06
Emergent Herbaceous Wetlands	0.06

Stone Lake Pollutant Loading Model

Unit Area Loading Coefficients	**Low**	**Mid**	**High**	
Precipitation	0.2	0.2	0.25	kg/ha/yr
Low Intensity Residential	0.2	0.25	0.5	
High Intensity Residential	0.2	0.25	0.5	
Commercial/Industrial/Transportation	0.15	0.25	0.3	
Deciduous Forest	0.05	0.07	0.1	
Evergreen Forest	0.05	0.07	0.1	
Upland Grasses & Forbs	0.05	0.07	0.1	
Pasture/Hay	0.15	0.2	0.4	
Row Crops	0.3	0.4	0.5	
Urban/Recreational Grasses	0.07	0.1	0.2	
Woody Wetlands	-0.2	-0.1	0	
Emergent Herbaceous Wetlands	-0.2	-0.1	0	
Phosphorus Loading (kg/y)				
Atmosphere	10	13	15	kg/yr
Low Intensity Residential	7	9	18	
High Intensity Residential	4	5	9	
Commercial/Industrial/Transportation	1	1	1	
Deciduous Forest	3	4	6	
Evergreen Forest	2.1	3.0	4.3	
Upland Grasses & Forbs	0.2	0.3	0.5	
Pasture/Hay	2.6	3.5	7.1	
Row Crops	23	31	38	
Urban/Recreational Grasses	0.8	1.1	2.2	
Woody Wetlands	-2.4	-1.2	0.0	
Emergent Herbaceous Wetlands	-2.0	-1.0	0.0	
Total	49	68	101	
Areal P Loading	0.8	1.1	1.7	kg/ha/yr
Lake Phosphorus Conc (mg/L)	0.05	0.07	0.10	mg/L
Prediction Uncertainty				
log P		-1.171		
positive model error		0.023		
negative model error		-0.017		
positive loading error		-0.009		
negative loading error		-0.017		
total positive uncertainty		0.025		
total negative uncertainty		0.024		
55% confidence limits	0.043		0.092	
90% confidence limits	0.019		0.117	

Harris Wetland Pollutant Loading Model

Unit Area Loading Coefficients	**Low**	**Mid**	**High**	
Precipitation	0.2	0.2	0.3	kg/ha/yr
Low Intensity Residential	0.2	0.3	0.5	
High Intensity Residential	0.2	0.3	0.5	
Commercial/Industrial/Transportation	0.2	0.3	0.3	
Deciduous Forest	0.1	0.1	0.1	
Evergreen Forest	0.1	0.1	0.1	
Upland Grasses & Forbs	0.1	0.1	0.1	
Pasture/Hay	0.2	0.2	0.4	
Row Crops	0.3	0.4	0.5	
Urban/Recreational Grasses	0.1	0.1	0.2	
Woody Wetlands	-0.20	-0.1	0.0	
Emergent Herbaceous Wetlands	-0.20	-0.1	0.0	
Phosphorus Loading (kg/y)				
Atmosphere	2	3	4	kg/yr
Low Intensity Residential	1	1	3	
High Intensity Residential	1	1	3	
Commercial/Industrial/Transportation	1	1	1	
Deciduous Forest	0.2	0.2	0.3	
Evergreen Forest	0.1	0.2	0.2	
Upland Grasses & Forbs	0.0	0.0	0.0	
Pasture/Hay	0.0	0.0	0.1	
Row Crops	0.3	0.4	0.5	
Urban/Recreational Grasses	0.0	0.0	0.1	
Woody Wetlands	-0.4	-0.2	0.0	
Emergent Herbaceous Wetlands	-1.7	-0.9	0.0	
Total	4	7	12	
Areal P Loading	0.3	0.5	0.8	kg/ha/yr
Lake Phosphorus Conc (mg/L)	0.02	0.04	0.06	mg/L
Prediction Uncertainty				
log P		-1.439		
positive model error		0.012		
negative model error		-0.009		
positive loading error		-0.008		
negative loading error		-0.014		
total positive uncertainty		0.015		
total negative uncertainty		0.016		
55% confidence limits	0.020		0.051	
90% confidence limits	0.003		0.066	

Pine Lake Pollutant Loading Model

Unit Area Loading Coefficients	**Low**	**Mid**	**High**	
Precipitation	0.2	0.2	0.3	kg/ha/yr
Low Intensity Residential	0.2	0.3	0.5	
High Intensity Residential	0.2	0.3	0.5	
Commercial/Industrial/Transportation	0.2	0.3	0.3	
Deciduous Forest	0.1	0.1	0.1	
Evergreen Forest	0.1	0.1	0.1	
Upland Grasses & Forbs	0.1	0.1	0.1	
Pasture/Hay	0.2	0.2	0.4	
Row Crops	0.3	0.4	0.5	
Urban/Recreational Grasses	0.1	0.1	0.2	
Woody Wetlands	-0.2	-0.1	0.0	
Emergent Herbaceous Wetlands	-0.2	-0.1	0.0	
Phosphorus Loading (kg/y)				
Atmosphere	37	46	55	kg/yr
Low Intensity Residential	26	32	65	
High Intensity Residential	5	6	12	
Commercial/Industrial/Transportation	4	6	8	
Deciduous Forest	19	27	39	
Evergreen Forest	13	18	26	
Upland Grasses & Forbs	4	6	8	
Pasture/Hay	62	82	164	
Row Crops	143	191	238	
Urban/Recreational Grasses	4	6	11	
Woody Wetlands	-16.1	-8.1	0	
Emergent Herbaceous Wetlands	-16.1	-8.0	0	
Total	285	404	626	
Areal P Loading	1	2	3	kg/ha/yr
Lake Phosphorus Conc (mg/L)	0.09	0.13	0.21	mg/L
Prediction Uncertainty				
log P		-0.877		
positive model error		0.046		
negative model error		-0.034		
positive loading error		-0.020		
negative loading error		-0.036		
total positive uncertainty		0.050		
total negative uncertainty		0.050		
55% confidence limits	0.083		0.182	
90% confidence limits	0.033		0.232	

Lower Lake Pollutant Loading Model

Unit Area Loading Coefficients	Low	Mid	High	
Precipitation	0.2	0.2	0.3	kg/ha/yr
Low Intensity Residential	0.2	0.3	0.5	
High Intensity Residential	0.2	0.3	0.5	
Commercial/Industrial/Transportation	0.2	0.3	0.3	
Deciduous Forest	0.1	0.1	0.1	
Evergreen Forest	0.1	0.1	0.1	
Upland Grasses & Forbs	0.1	0.1	0.1	
Pasture/Hay	0.2	0.2	0.4	
Row Crops	0.3	0.4	0.5	
Urban/Recreational Grasses	0.1	0.1	0.2	
Woody Wetlands	-0.20	-0.1	0.0	
Emergent Herbaceous Wetlands	-0.20	-0.1	0.0	
Phosphorus Loading (kg/y)				
Atmosphere	2.5	3.1	3.7	kg/yr
Low Intensity Residential	1.5	1.9	3.9	
High Intensity Residential	1.3	1.7	3.3	
Commercial/Industrial/Transportation	0.0	0.0	0.0	
Deciduous Forest	0.2	0.2	0.3	
Evergreen Forest	0.2	0.2	0.3	
Upland Grasses & Forbs	0.0	0.1	0.1	
Pasture/Hay	0.3	0.3	0.7	
Row Crops	0.3	0.4	0.5	
Urban/Recreational Grasses	0.0	0.0	0.1	
Woody Wetlands	-0.1	0.0	0.0	
Emergent Herbaceous Wetlands	-3.1	-1.6	0.0	
Total	3.2	6.5	13	
Areal P Loading	0.1	0.2	0.3	kg/ha/yr
Lake Phosphorus Conc (mg/L)	0.01	0.01	0.03	mg/L
Prediction Uncertainty				
log P		-1.868		
positive model error		0.005		
negative model error		-0.003		
positive loading error		-0.003		
negative loading error		-0.007		
total positive uncertainty		0.006		
total negative uncertainty		0.008		
55% confidence limits	0.006		0.019	
90% confidence limits	-0.002		0.025	

Clear Lake Pollutant Loading Model

Unit Area Loading Coefficients	Low	Mid	High	
Precipitation	0.2	0.2	0.3	kg/ha/yr
Low Intensity Residential	0.2	0.3	0.5	
High Intensity Residential	0.2	0.3	0.5	
Commercial/Industrial/Transportation	0.2	0.3	0.3	
Deciduous Forest	0.1	0.1	0.1	
Evergreen Forest	0.1	0.1	0.1	
Upland Grasses & Forbs	0.1	0.1	0.1	
Pasture/Hay	0.2	0.2	0.4	
Row Crops	0.3	0.4	0.5	
Urban/Recreational Grasses	0.1	0.1	0.2	
Woody Wetlands	-0.20	-0.1	0.0	
Emergent Herbaceous Wetlands	-0.20	-0.1	0.0	
Phosphorus Loading (kg/y)				
Atmosphere	6.4	7.9	9.4	kg/yr
Low Intensity Residential	1.8	2.3	4.5	
High Intensity Residential	2.7	3.4	6.8	
Commercial/Industrial/Transportation	8.1	13.5	16.1	
Deciduous Forest	0.5	0.7	1.0	
Evergreen Forest	0.4	0.6	0.9	
Upland Grasses & Forbs	0.2	0.3	0.4	
Pasture/Hay	0.3	0.3	0.7	
Row Crops	1.5	2.1	2.6	
Urban/Recreational Grasses	0.5	0.7	1.5	
Woody Wetlands	-0.5	-0.3	0.0	
Emergent Herbaceous Wetlands	-0.3	-0.2	0.0	
Total	21.5	31.3	43.8	
Adjustment for Sediment Trap				
Low Intensity Residential	-1.1	-1.3	-2.7	kg/yr
High Intensity Residential	-1.6	-2.0	-4.0	
Commercial/Industrial/Transportation	-3.6	-6.0	-7.2	
Deciduous Forest	0.0	0.0	0.0	
Total	-6.3	-9.3	-13.9	
Net Phosphorus Loading	15.3	21.9	29.9	kg/yr
Areal P Loading	0.4	0.6	0.8	kg/ha/yr
Lake Phosphorus Conc (mg/L)	0.03	0.04	0.06	mg/L
Prediction Uncertainty				
log P		-1.367		
positive model error		0.015		
negative model error		-0.011		
positive loading error		-0.007		
negative loading error		-0.008		
total positive uncertainty		0.016		
total negative uncertainty		0.013		
55% confidence limits	0.029		0.059	
90% confidence limits	0.016		0.075	

Lily Lake Pollutant Loading Model

Unit Area Loading Coefficients	**Low**	**Mid**	**High**	
Precipitation	0.2	0.2	0.3	kg/ha/yr
Low Intensity Residential	0.2	0.3	0.5	
High Intensity Residential	0.2	0.3	0.5	
Commercial/Industrial/Transportation	0.2	0.3	0.3	
Deciduous Forest	0.1	0.1	0.1	
Evergreen Forest	0.1	0.1	0.1	
Upland Grasses & Forbs	0.1	0.1	0.1	
Pasture/Hay	0.2	0.2	0.4	
Row Crops	0.3	0.4	0.5	
Urban/Recreational Grasses	0.1	0.1	0.2	
Woody Wetlands	-0.20	-0.1	0.0	
Emergent Herbaceous Wetlands	-0.20	-0.1	0.0	
Phosphorus Loading (kg/y)				
Atmosphere	2	2	3	kg/yr
Low Intensity Residential	2	3	6	
High Intensity Residential	5	6	13	
Commercial/Industrial/Transportation	7	11	14	
Deciduous Forest	0.4	0.5	0.8	
Evergreen Forest	0.3	0.4	0.5	
Upland Grasses & Forbs	0.0	0.0	0.0	
Pasture/Hay	0.0	0.0	0.0	
Row Crops	0.0	0.0	0.0	
Urban/Recreational Grasses	0.2	0.2	0.5	
Woody Wetlands	-0.6	-0.3	0.0	
Emergent Herbaceous Wetlands	-1.5	-0.8	0.0	
Total	15	23	37	
Areal P Loading	1.3	2.1	3.3	kg/ha/yr
Lake Phosphorus Conc (mg/L)	0.06	0.09	0.15	mg/L
Prediction Uncertainty				
log P		-1.033		
positive model error		0.032		
negative model error		-0.024		
positive loading error		-0.017		
negative loading error		-0.028		
total positive uncertainty		0.036		
total negative uncertainty		0.036		
55% confidence limits	0.056		0.128	
90% confidence limits	0.020		0.164	

Phosphorus Loading (kg/yr)	Clear	Lower	Pine	Harris	Stone	Lily
Atmosphere	7.9	3.1	46	3	13	2
Low Intensity Residential	0.9	1.9	32	1	9	3
High Intensity Residential	1.4	1.7	6	1	5	6
Commercial/Industrial/Transportation	7.4	0.0	6	1	1	11
Deciduous Forest	0.7	0.2	27	0	4	1
Evergreen Forest	0.6	0.2	18	0	3	0
Upland Grasses & Forbs	0.3	0.1	6	0	0	0
Pasture/Hay	0.3	0.3	82	0	4	0
Row Crops	2.1	0.4	191	0	31	0
Urban/Recreational Grasses	0.7	0.0	6	0	1	0
Woody Wetlands	-0.3	0.0	-8	0	-1	0
Emergent Herbaceous Wetlands	-0.2	-1.6	-8	-1	-1	-1
Total	21.9	6.5	404	6.6	67.5	23.3

Phosphorus Loading (lb/yr)	Clear	Lower	Pine	Harris	Stone	Lily
Atmosphere	17.4	6.8	101.8	6.6	28.0	5.2
Low Intensity Residential	2.0	4.3	71.4	3.1	19.3	6.6
High Intensity Residential	3.1	3.7	13.6	3.0	10.2	14.1
Commercial/Industrial/Transportation	16.4	0.0	14.1	2.5	2.7	25.0
Deciduous Forest	1.5	0.5	59.5	0.5	8.7	1.2
Evergreen Forest	1.3	0.5	39.8	0.3	6.6	0.8
Upland Grasses & Forbs	0.6	0.1	12.4	0.0	0.7	0.0
Pasture/Hay	0.8	0.8	181.0	0.1	7.8	0.0
Row Crops	4.5	1.0	420.2	0.8	67.3	0.0
Urban/Recreational Grasses	1.6	0.1	12.3	0.1	2.4	0.5
Woody Wetlands	-0.6	-0.1	-17.8	-0.4	-2.6	-0.7
Emergent Herbaceous Wetlands	-0.3	-3.4	-17.7	-1.9	-2.2	-1.7
Total	48.3	14.2	890.7	14.6	148.8	51.3

Phosphorus Loading (% by source)						
Atmosphere	36%	48%	11%	45%	19%	10%
Low Intensity Residential	4%	30%	8%	21%	13%	13%
High Intensity Residential	6%	26%	2%	20%	7%	28%
Commercial/Industrial/Transportation	34%	0%	2%	17%	2%	49%
Deciduous Forest	3%	4%	7%	4%	6%	2%
Evergreen Forest	3%	4%	4%	2%	4%	2%
Upland Grasses & Forbs	1%	1%	1%	0%	0%	0%
Pasture/Hay	2%	5%	20%	1%	5%	0%
Row Crops	9%	7%	47%	5%	45%	0%
Urban/Recreational Grasses	3%	1%	1%	0%	2%	1%
Woody Wetlands	-1%	-1%	-2%	-3%	-2%	-1%
Emergent Herbaceous Wetlands	-1%	-24%	-2%	-13%	-2%	-3%
Total	100%	100%	100%	100%	100%	100%

APPENDIX C

ANALYSIS OF BEACH CLOSURE DATA

The La Porte County Health Department monitors the sanitary quality of water at public swimming beaches. The historic data are available at http://www.laportecountybeaches.com/resources/historical.html, and represent beach conditions 1991 through 2005. The Department did not respond to requests for data from 2006. These data were collected by the Department to monitor compliance with the State water quality standards; when *E. coli* levels exceeded 235 CFU per 100 mL, the beach was closed until concentrations were reduced to acceptable levels.

Table C-1 summarizes the beach closure data for beaches located on one of the six study lakes. For example, the new beach on Stone Lake was closed for zero days in 1991, but 4 days in 1992 due to high *E. coli* levels.

Table C-1

DAYS OF BEACH CLOSURES IN LA PORTE

Year	New Stone	Old Stone	Pine Lake - Assembly	Pine Lake - Kiwanis	Pine Lake – Waverly Rd	Stone Lake - Boat Launch
1991	0	1	0	0	1	0
1992	4	0	.	2	0	0
1993	1	1	.	1	0	1
1994	0	0	.	0	0	0
1995	0	0	.	0	0	0
1996	1	0	.	1	0	0
1997	0	0	.	0	0	0
1998	0	0	.	0	0	0
1999	3	0	.	0	0	0

Table C-1

DAYS OF BEACH CLOSURES IN LA PORTE

Year	New Stone	Old Stone	Pine Lake - Assembly	Pine Lake - Kiwanis	Pine Lake – Waverly Rd	Stone Lake - Boat Launch
2000	7	8	.	0	0	0
2001	0	3	0	0	0	0
2002	7	1	2	4	2	1
2003	4	6	1	1	1	2
2004	8	1	1	3	1	3
2005	7	1	0	4	3	1
Sum	38	22	4	16	8	8

Figures C-1 and C-2 are boxplots summarizing the *E. coli* concentrations (log-transformed) by year and by beach. We see no obvious patterns or trends in these data.

Communities across the nation have increased beach monitoring in recent years, as federal assistance with research and monitoring programs was increased. Many communities have found concentrations of *E. coli* at beaches to depend on a variety of natural causes, including bird populations (gulls, ducks, geese), weather, and sediment disturbance. Interestingly, a correlation between the number of days the beaches are closed each year is positively associated with the number of *E. coli* measurements taken during the summer (Pearson correlation coef=0.611, p=0.000). Figure C-3 is a scatterplot illustrating this point. This correlation does not indicate cause and effect. Rather, it reflects the fact that coliform bacteria concentrations are highly variable, and many sampling events are necessary to estimate concentrations and identify sources.

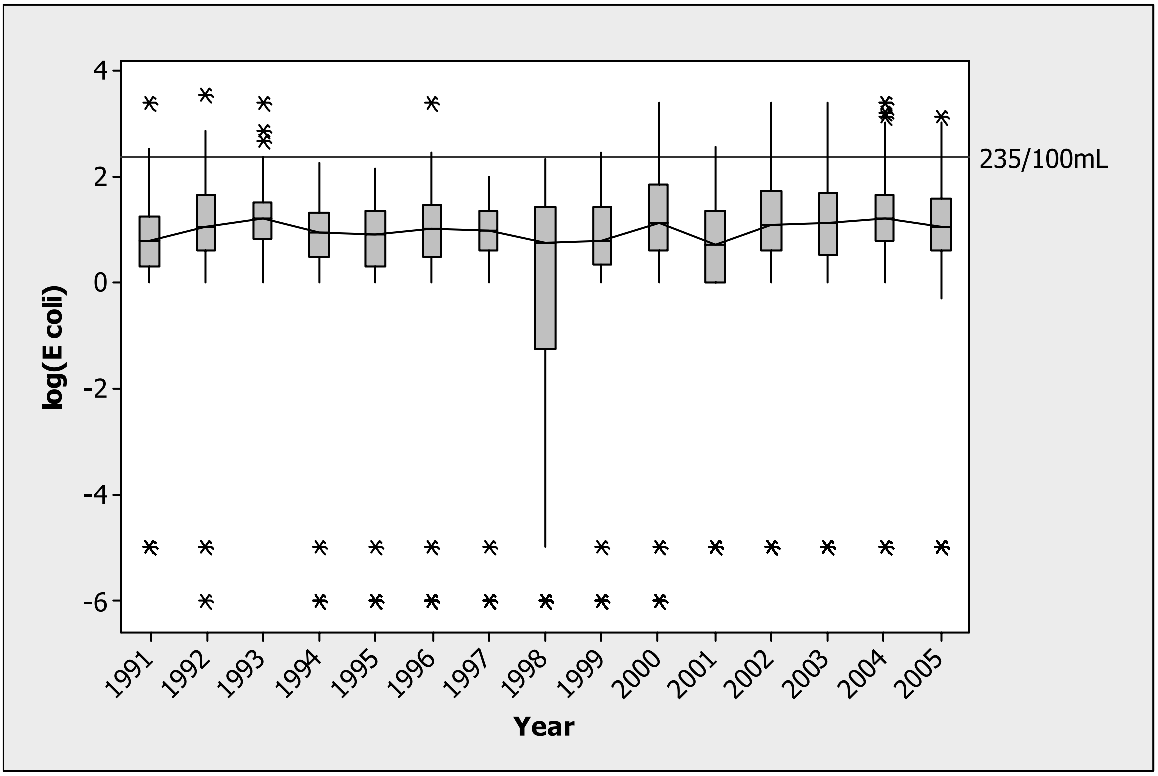


Figure C-1. Boxplot of Log-transformed Annual Beach Closures over Time.

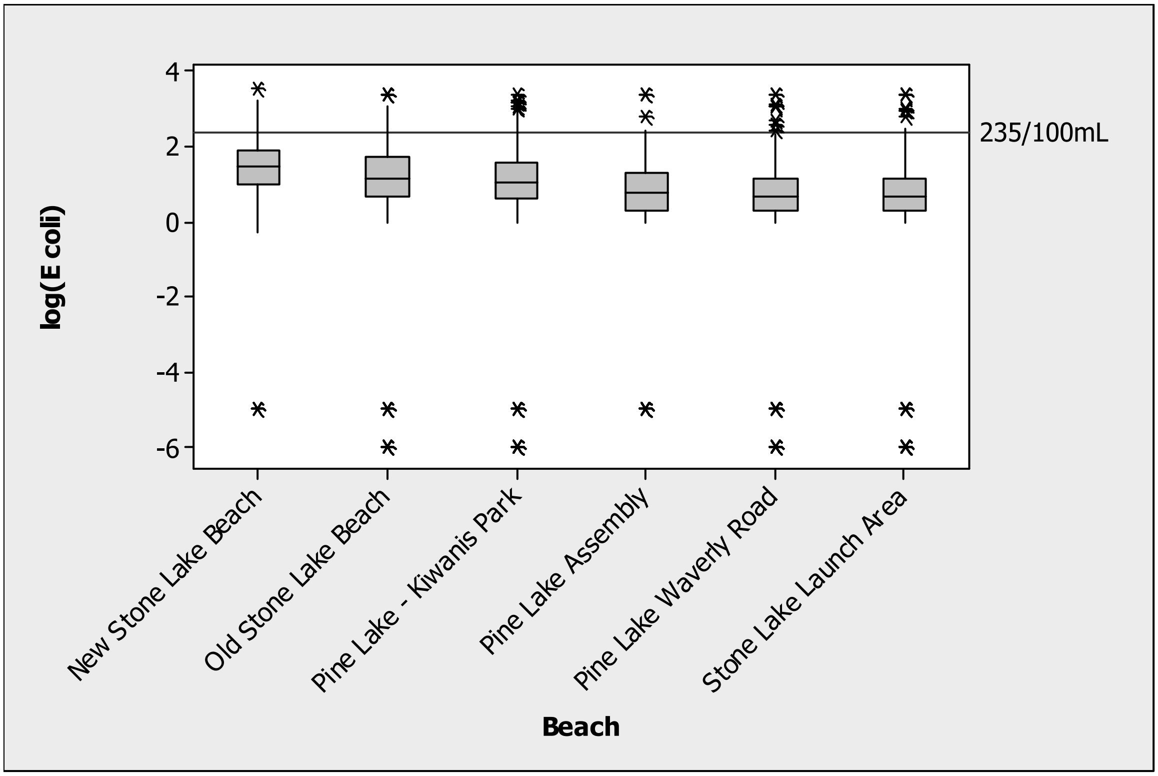


Figure C-2. Boxplot of Log-transformed Beach E coli Concentrations.

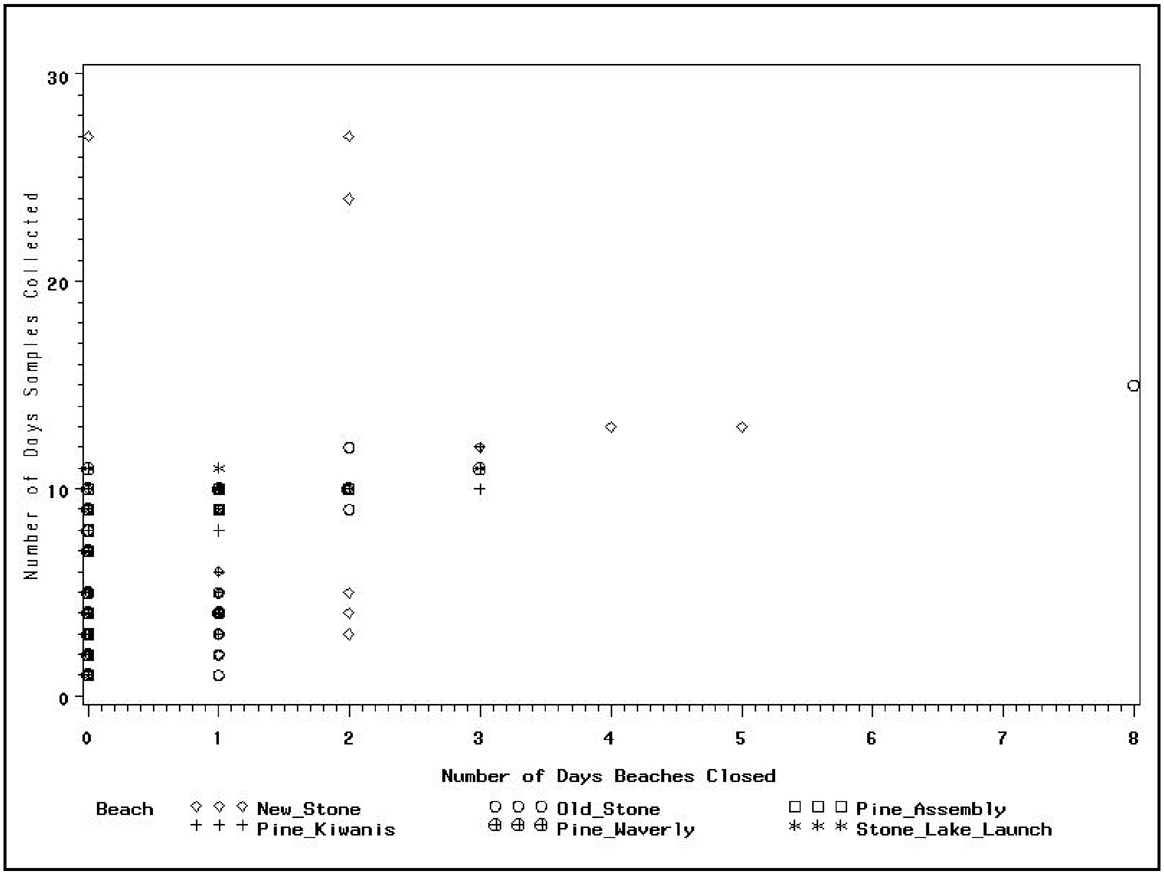


Figure C-3. Scatterplot of Annual Days Beaches are Closed and Numbers of Samples Collected.

Beach=New_Stone

Beach	Date	Observations	Closures
New_Stone	06-1991	2	0
New_Stone	07-1991	5	0
New_Stone	08-1991	3	0
New_Stone	09-1991	4	0
New_Stone	10-1991	1	0
New_Stone	05-1992	2	0
New_Stone	06-1992	4	0
New_Stone	07-1992	6	1
New_Stone	08-1992	5	2
New_Stone	09-1992	3	1
New_Stone	05-1993	1	0
New_Stone	06-1993	4	0
New_Stone	07-1993	5	0
New_Stone	08-1993	4	0
New_Stone	09-1993	3	1
New_Stone	05-1994	2	0
New_Stone	06-1994	5	0
New_Stone	07-1994	4	0
New_Stone	08-1994	4	0
New_Stone	09-1994	3	0
New_Stone	05-1995	1	0
New_Stone	06-1995	5	0
New_Stone	07-1995	4	0
New_Stone	08-1995	5	0

Beach	Date	Observations	Closures
New_Stone	09-1995	2	0
New_Stone	05-1996	2	0
New_Stone	06-1996	4	0
New_Stone	07-1996	5	1
New_Stone	08-1996	5	0
New_Stone	09-1996	3	0
New_Stone	05-1997	1	0
New_Stone	06-1997	4	0
New_Stone	07-1997	4	0
New_Stone	08-1997	4	0
New_Stone	09-1997	1	0
New_Stone	05-1998	2	0
New_Stone	06-1998	5	0
New_Stone	07-1998	5	0
New_Stone	08-1998	4	0
New_Stone	09-1998	2	0
New_Stone	05-1999	2	0
New_Stone	06-1999	10	1
New_Stone	07-1999	9	0
New_Stone	08-1999	10	2
New_Stone	09-1999	1	0
New_Stone	05-2000	3	0
New_Stone	06-2000	10	1
New_Stone	07-2000	9	0
New_Stone	08-2000	13	5
New_Stone	09-2000	4	1

Beach	Date	Observations	Closures
New_Stone	05-2001	4	0
New_Stone	06-2001	9	0
New_Stone	07-2001	9	0
New_Stone	08-2001	10	0
New_Stone	09-2001	2	0
New_Stone	05-2002	5	1
New_Stone	06-2002	9	1
New_Stone	07-2002	10	2
New_Stone	08-2002	9	1
New_Stone	09-2002	4	2
New_Stone	05-2003	4	1
New_Stone	06-2003	10	1
New_Stone	07-2003	10	0
New_Stone	08-2003	7	0
New_Stone	09-2003	3	2
New_Stone	05-2004	2	0
New_Stone	06-2004	10	1
New_Stone	07-2004	10	2
New_Stone	08-2004	13	4
New_Stone	09-2004	2	1
New_Stone	05-2005	12	3
New_Stone	06-2005	27	2
New_Stone	07-2005	24	2
New_Stone	08-2005	27	0
New_Stone	09-2005	3	0

Beach=Old_Stone

Beach	Date	Observations	Closures
Old_Stone	06-1991	3	1
Old_Stone	07-1991	5	0
Old_Stone	08-1991	4	0
Old_Stone	09-1991	4	0
Old_Stone	10-1991	1	0
Old_Stone	05-1992	2	0
Old_Stone	06-1992	4	0
Old_Stone	07-1992	5	0
Old_Stone	08-1992	4	0
Old_Stone	09-1992	3	0
Old_Stone	05-1993	1	0
Old_Stone	06-1993	4	0
Old_Stone	07-1993	5	1
Old_Stone	08-1993	4	0
Old_Stone	09-1993	2	0
Old_Stone	05-1994	2	0
Old_Stone	06-1994	5	0
Old_Stone	07-1994	4	0
Old_Stone	08-1994	4	0
Old_Stone	09-1994	3	0
Old_Stone	05-1995	1	0
Old_Stone	06-1995	5	0
Old_Stone	07-1995	4	0
Old_Stone	08-1995	5	0

Beach	Date	Observations	Closures
Old_Stone	09-1995	2	0
Old_Stone	05-1996	2	0
Old_Stone	06-1996	4	0
Old_Stone	07-1996	4	0
Old_Stone	08-1996	5	0
Old_Stone	09-1996	3	0
Old_Stone	05-1997	1	0
Old_Stone	06-1997	4	0
Old_Stone	07-1997	4	0
Old_Stone	08-1997	4	0
Old_Stone	09-1997	1	0
Old_Stone	05-1998	2	0
Old_Stone	06-1998	5	0
Old_Stone	07-1998	5	0
Old_Stone	08-1998	4	0
Old_Stone	09-1998	2	0
Old_Stone	05-1999	2	0
Old_Stone	06-1999	9	0
Old_Stone	07-1999	9	0
Old_Stone	08-1999	9	0
Old_Stone	09-1999	1	0
Old_Stone	05-2000	3	0
Old_Stone	06-2000	9	0
Old_Stone	07-2000	7	0
Old_Stone	08-2000	15	8
Old_Stone	09-2000	3	0

Beach	Date	Observations	Closures
Old_Stone	05-2001	4	0
Old_Stone	06-2001	10	1
Old_Stone	07-2001	9	0
Old_Stone	08-2001	10	2
Old_Stone	09-2001	2	0
Old_Stone	05-2002	4	0
Old_Stone	06-2002	8	0
Old_Stone	07-2002	10	1
Old_Stone	08-2002	9	0
Old_Stone	09-2002	3	0
Old_Stone	05-2003	4	1
Old_Stone	06-2003	9	0
Old_Stone	07-2003	12	2
Old_Stone	08-2003	9	2
Old_Stone	09-2003	2	1
Old_Stone	05-2004	2	0
Old_Stone	06-2004	9	0
Old_Stone	07-2004	9	0
Old_Stone	08-2004	10	1
Old_Stone	09-2004	1	0
Old_Stone	05-2005	3	0
Old_Stone	06-2005	9	1
Old_Stone	07-2005	8	0
Old_Stone	08-2005	9	0
Old_Stone	09-2005	1	0
Old_Stone	06-2006	1	1

Beach=Pine_Assembly

Beach	Date	Observations	Closures
Pine_Assembly	06-1991	1	0
Pine_Assembly	07-1991	1	0
Pine_Assembly	05-2001	1	0
Pine_Assembly	06-2001	9	0
Pine_Assembly	07-2001	9	0
Pine_Assembly	08-2001	9	0
Pine_Assembly	09-2001	2	0
Pine_Assembly	05-2002	4	0
Pine_Assembly	06-2002	8	0
Pine_Assembly	07-2002	10	2
Pine_Assembly	08-2002	9	0
Pine_Assembly	09-2002	3	0
Pine_Assembly	05-2003	4	0
Pine_Assembly	06-2003	10	1
Pine_Assembly	07-2003	10	0
Pine_Assembly	08-2003	7	0
Pine_Assembly	09-2003	1	0
Pine_Assembly	05-2004	2	0
Pine_Assembly	06-2004	9	0
Pine_Assembly	07-2004	9	0
Pine_Assembly	08-2004	9	1
Pine_Assembly	09-2004	1	0
Pine_Assembly	05-2005	3	0

Beach	Date	Observations	Closures
Pine_Assembly	06-2005	9	0
Pine_Assembly	07-2005	8	0
Pine_Assembly	08-2005	9	0
Pine_Assembly	09-2005	1	0

Beach=Pine_Kiwanis

Beach	Date	Observations	Closures
Pine_Kiwanis	06-1991	2	0
Pine_Kiwanis	07-1991	5	0
Pine_Kiwanis	08-1991	4	0
Pine_Kiwanis	09-1991	4	0
Pine_Kiwanis	10-1991	1	0
Pine_Kiwanis	05-1992	2	0
Pine_Kiwanis	06-1992	4	0
Pine_Kiwanis	07-1992	6	1
Pine_Kiwanis	08-1992	4	0
Pine_Kiwanis	09-1992	3	1
Pine_Kiwanis	05-1993	1	0
Pine_Kiwanis	06-1993	4	0
Pine_Kiwanis	07-1993	5	1
Pine_Kiwanis	08-1993	4	0
Pine_Kiwanis	09-1993	2	0
Pine_Kiwanis	05-1994	2	0
Pine_Kiwanis	06-1994	5	0
Pine_Kiwanis	07-1994	4	0

Beach	Date	Observations	Closures
Pine_Kiwanis	08-1994	4	0
Pine_Kiwanis	09-1994	3	0
Pine_Kiwanis	05-1995	1	0
Pine_Kiwanis	06-1995	5	0
Pine_Kiwanis	07-1995	4	0
Pine_Kiwanis	08-1995	5	0
Pine_Kiwanis	09-1995	2	0
Pine_Kiwanis	05-1996	2	0
Pine_Kiwanis	06-1996	4	0
Pine_Kiwanis	07-1996	5	1
Pine_Kiwanis	08-1996	5	0
Pine_Kiwanis	09-1996	3	0
Pine_Kiwanis	05-1997	1	0
Pine_Kiwanis	06-1997	4	0
Pine_Kiwanis	07-1997	4	0
Pine_Kiwanis	08-1997	4	0
Pine_Kiwanis	09-1997	1	0
Pine_Kiwanis	05-1998	2	0
Pine_Kiwanis	06-1998	5	0
Pine_Kiwanis	07-1998	5	0
Pine_Kiwanis	08-1998	4	0
Pine_Kiwanis	09-1998	2	0
Pine_Kiwanis	05-1999	2	0
Pine_Kiwanis	06-1999	9	0
Pine_Kiwanis	07-1999	9	0
Pine_Kiwanis	08-1999	9	0

Beach	Date	Observations	Closures
Pine_Kiwanis	09-1999	1	0
Pine_Kiwanis	05-2000	3	0
Pine_Kiwanis	06-2000	9	0
Pine_Kiwanis	07-2000	7	0
Pine_Kiwanis	08-2000	11	0
Pine_Kiwanis	09-2000	2	0
Pine_Kiwanis	05-2001	4	0
Pine_Kiwanis	06-2001	9	0
Pine_Kiwanis	07-2001	9	0
Pine_Kiwanis	08-2001	9	0
Pine_Kiwanis	09-2001	2	0
Pine_Kiwanis	05-2002	4	0
Pine_Kiwanis	06-2002	9	1
Pine_Kiwanis	07-2002	12	3
Pine_Kiwanis	08-2002	9	0
Pine_Kiwanis	09-2002	3	0
Pine_Kiwanis	05-2003	4	0
Pine_Kiwanis	06-2003	9	0
Pine_Kiwanis	07-2003	10	0
Pine_Kiwanis	08-2003	8	1
Pine_Kiwanis	09-2003	1	0
Pine_Kiwanis	05-2004	2	0
Pine_Kiwanis	06-2004	9	0
Pine_Kiwanis	07-2004	10	2
Pine_Kiwanis	08-2004	10	1
Pine_Kiwanis	09-2004	1	0

Beach	Date	Observations	Closures
Pine_Kiwanis	05-2005	3	0
Pine_Kiwanis	06-2005	9	1
Pine_Kiwanis	07-2005	10	3
Pine_Kiwanis	08-2005	9	0
Pine_Kiwanis	09-2005	1	0

Beach=Pine_Waverly

Beach	Date	Observations	Closures
Pine_Waverly	06-1991	3	0
Pine_Waverly	07-1991	5	0
Pine_Waverly	08-1991	3	0
Pine_Waverly	09-1991	4	1
Pine_Waverly	10-1991	1	0
Pine_Waverly	05-1992	2	0
Pine_Waverly	06-1992	4	0
Pine_Waverly	07-1992	5	0
Pine_Waverly	08-1992	4	0
Pine_Waverly	09-1992	3	0
Pine_Waverly	05-1993	1	0
Pine_Waverly	06-1993	4	0
Pine_Waverly	07-1993	5	0
Pine_Waverly	08-1993	4	0
Pine_Waverly	09-1993	2	0
Pine_Waverly	05-1994	2	0
Pine_Waverly	06-1994	5	0

Beach	Date	Observations	Closures
Pine_Waverly	07-1994	4	0
Pine_Waverly	08-1994	4	0
Pine_Waverly	09-1994	3	0
Pine_Waverly	05-1995	1	0
Pine_Waverly	06-1995	5	0
Pine_Waverly	07-1995	4	0
Pine_Waverly	08-1995	5	0
Pine_Waverly	09-1995	2	0
Pine_Waverly	05-1996	2	0
Pine_Waverly	06-1996	4	0
Pine_Waverly	07-1996	4	0
Pine_Waverly	08-1996	5	0
Pine_Waverly	09-1996	3	0
Pine_Waverly	05-1997	1	0
Pine_Waverly	06-1997	4	0
Pine_Waverly	07-1997	4	0
Pine_Waverly	08-1997	4	0
Pine_Waverly	09-1997	1	0
Pine_Waverly	05-1998	2	0
Pine_Waverly	06-1998	5	0
Pine_Waverly	07-1998	5	0
Pine_Waverly	08-1998	4	0
Pine_Waverly	09-1998	2	0
Pine_Waverly	05-1999	2	0
Pine_Waverly	06-1999	9	0
Pine_Waverly	07-1999	9	0

Beach	Date	Observations	Closures
Pine_Waverly	08-1999	9	0
Pine_Waverly	09-1999	1	0
Pine_Waverly	05-2000	3	0
Pine_Waverly	06-2000	9	0
Pine_Waverly	07-2000	7	0
Pine_Waverly	08-2000	11	0
Pine_Waverly	09-2000	2	0
Pine_Waverly	05-2001	4	0
Pine_Waverly	06-2001	9	0
Pine_Waverly	07-2001	9	0
Pine_Waverly	08-2001	9	0
Pine_Waverly	09-2001	2	0
Pine_Waverly	05-2002	4	0
Pine_Waverly	06-2002	8	0
Pine_Waverly	07-2002	10	2
Pine_Waverly	08-2002	9	0
Pine_Waverly	09-2002	3	0
Pine_Waverly	05-2003	4	1
Pine_Waverly	06-2003	9	0
Pine_Waverly	07-2003	10	0
Pine_Waverly	08-2003	7	0
Pine_Waverly	09-2003	1	0
Pine_Waverly	05-2004	2	0
Pine_Waverly	06-2004	10	1
Pine_Waverly	07-2004	9	0
Pine_Waverly	08-2004	9	0

Beach	Date	Observations	Closures
Pine_Waverly	09-2004	1	0
Pine_Waverly	05-2005	3	0
Pine_Waverly	06-2005	9	0
Pine_Waverly	07-2005	11	3
Pine_Waverly	08-2005	9	0
Pine_Waverly	09-2005	1	0

Beach=Stone_Lake_Launch

Beach	Date	Observations	Closures
Stone_Lake_Launch	06-1991	2	0
Stone_Lake_Launch	07-1991	5	0
Stone_Lake_Launch	08-1991	3	0
Stone_Lake_Launch	09-1991	4	0
Stone_Lake_Launch	10-1991	1	0
Stone_Lake_Launch	05-1992	2	0
Stone_Lake_Launch	06-1992	4	0
Stone_Lake_Launch	07-1992	5	0
Stone_Lake_Launch	08-1992	4	0
Stone_Lake_Launch	09-1992	3	0
Stone_Lake_Launch	05-1993	1	0
Stone_Lake_Launch	06-1993	4	0
Stone_Lake_Launch	07-1993	5	0
Stone_Lake_Launch	08-1993	4	1
Stone_Lake_Launch	09-1993	2	0
Stone_Lake_Launch	05-1994	2	0

Beach	Date	Observations	Closures
Stone_Lake_Launch	06-1994	5	0
Stone_Lake_Launch	07-1994	4	0
Stone_Lake_Launch	08-1994	4	0
Stone_Lake_Launch	09-1994	3	0
Stone_Lake_Launch	05-1995	1	0
Stone_Lake_Launch	06-1995	5	0
Stone_Lake_Launch	07-1995	4	0
Stone_Lake_Launch	08-1995	5	0
Stone_Lake_Launch	09-1995	2	0
Stone_Lake_Launch	05-1996	2	0
Stone_Lake_Launch	06-1996	4	0
Stone_Lake_Launch	07-1996	4	0
Stone_Lake_Launch	08-1996	5	0
Stone_Lake_Launch	09-1996	3	0
Stone_Lake_Launch	05-1997	1	0
Stone_Lake_Launch	06-1997	4	0
Stone_Lake_Launch	07-1997	4	0
Stone_Lake_Launch	08-1997	4	0
Stone_Lake_Launch	09-1997	1	0
Stone_Lake_Launch	05-1998	2	0
Stone_Lake_Launch	06-1998	5	0
Stone_Lake_Launch	07-1998	5	0
Stone_Lake_Launch	08-1998	4	0
Stone_Lake_Launch	09-1998	2	0
Stone_Lake_Launch	05-1999	2	0
Stone_Lake_Launch	06-1999	9	0

Beach	Date	Observations	Closures
Stone_Lake_Launch	07-1999	9	0
Stone_Lake_Launch	08-1999	9	0
Stone_Lake_Launch	09-1999	1	0
Stone_Lake_Launch	05-2000	3	0
Stone_Lake_Launch	06-2000	9	0
Stone_Lake_Launch	07-2000	7	0
Stone_Lake_Launch	08-2000	11	0
Stone_Lake_Launch	09-2000	2	0
Stone_Lake_Launch	05-2001	4	0
Stone_Lake_Launch	06-2001	9	0
Stone_Lake_Launch	07-2001	9	0
Stone_Lake_Launch	08-2001	9	0
Stone_Lake_Launch	09-2001	2	0
Stone_Lake_Launch	05-2002	4	0
Stone_Lake_Launch	06-2002	9	1
Stone_Lake_Launch	07-2002	9	0
Stone_Lake_Launch	08-2002	9	0
Stone_Lake_Launch	09-2002	3	0
Stone_Lake_Launch	05-2003	4	0
Stone_Lake_Launch	06-2003	10	1
Stone_Lake_Launch	07-2003	11	1
Stone_Lake_Launch	08-2003	7	0
Stone_Lake_Launch	09-2003	1	0
Stone_Lake_Launch	05-2004	2	0
Stone_Lake_Launch	06-2004	9	0
Stone_Lake_Launch	07-2004	11	3

Beach	Date	Observations	Closures
Stone_Lake_Launch	08-2004	9	0
Stone_Lake_Launch	09-2004	1	0
Stone_Lake_Launch	05-2005	3	0
Stone_Lake_Launch	06-2005	9	0
Stone_Lake_Launch	07-2005	9	1
Stone_Lake_Launch	08-2005	9	0
Stone_Lake_Launch	09-2005	1	0

APPENDIX D

IDEM FISH TISSUE DATA

Indiana Department of Environmental
Office of Water Quality-Assessment Branch- Biological Studies
Fish Tissue Contaminant Results Summary

SiteID: UMK030-0026 **USGS Hydrologic** 07120001030050

Stream Name: Stone Lake **County** Laporte

Description: LAPORTE, IN **Latitude:** 41 36 42 **Longitude:** -86 44 47

Sample Date: 7/20/1999 **Lab ID #: 901551001** **Fish Sample Number: 901551001**

2 largemouth bass **Mean Length (mm)** **Mean Weight**

Skin-On Fillets, Scaleless **340** (311 - 369) **482** (397 - 567)

		Result		Reporting Limit	Metho
Lipids		2.02	%		
Solids		19.8	%		
Cadmium	<	-1	ug/Kg ww	15	
Lead	<	-1	ug/Kg ww	70	
Mercury		110	ug/Kg ww		
2,4'-DDD	<	-1	ug/Kg ww	5	
2,4'-DDE	<	-1	ug/Kg ww	5	
2,4'-DDT	<	-1	ug/Kg ww	5	
4,4'-DDD	<	-1	ug/Kg ww	5	
4,4'-DDE		16	ug/Kg ww		
4,4'-DDT	<	-1	ug/Kg ww	5	
Aldrin	<	-1	ug/Kg ww	2.5	
Alpha-BHC	<	-1	ug/Kg ww	2.5	
Beta-BHC	<	-1	ug/Kg ww	2.5	
Chlordane, Alpha-	J	2	ug/Kg ww		
Chlordane, Gamma-	<	-1	ug/Kg ww	2.5	
Delta-BHC	<	-1	ug/Kg ww	2.5	
Dieldrin	J	2.6	ug/Kg ww		
Endosulfan I	<	-1	ug/Kg ww	2.5	
Endosulfan II	<	-1	ug/Kg ww	5	
Endosulfan Sulfate	<	-1	ug/Kg ww	5	
Endrin	<	-1	ug/Kg ww	5	
Endrin Aldehyde	<	-1	ug/Kg ww	5	
Endrin Ketone	<	-1	ug/Kg ww	5	
Gamma-BHC (Lindane)	<	-1	ug/Kg ww	2.5	
Heptachlor	<	-1	ug/Kg ww	2.5	
Heptachlor Epoxide	<	-1	ug/Kg ww	2.5	
Methoxychlor	<	-1	ug/Kg ww	20	
Nonachlor, cis-	<	-1	ug/Kg ww	5	
Nonachlor, trans-	J	3.2	ug/Kg ww		
Oxychlordane	<	-1	ug/Kg ww	5	
Pentachloroanisole	<	-1	ug/Kg ww	2.5	
Toxaphene	<	-1	ug/Kg ww	46	
Hexachlorobenzene	<	-1	ug/Kg ww	2.5	
Aroclor 1016	<	-1	ug/Kg ww	50	
Aroclor 1221	<	-1	ug/Kg ww	50	
Aroclor 1232	<	-1	ug/Kg ww	50	
Aroclor 1242	<	-1	ug/Kg ww	50	
Aroclor 1248	<	-1	ug/Kg ww	50	
Aroclor 1254	<	-1	ug/Kg ww	50	
Aroclor 1260	J	36	ug/Kg ww		
Total PCBs	J	36	ug/Kg ww		

Sample Date: 7/20/1999 **Lab ID #: 901551001** **Fish Sample Number: 901551001**

Indiana Department of Environmental
Office of Water Quality-Assessment Branch- Biological Studies
Fish Tissue Contaminant Results Summary

SiteID: UMK030-0026 **USGS Hydrologic** 07120001030050

Stream Name: Stone Lake **County** Laporte

Description: LAPORTE, IN **Latitude:** 41 36 42 **Longitude:** -86 44 47

Sample Date: **7/20/1999** **Lab ID #:** **901551002** **Fish Sample Number:** **901551002**

1 smallmouth bass **Mean Length (mm)** **Mean Weight**
Skin-On Fillets, Scaleless **335** (335 - 335) **425** (425 - 425)

		Result		Reporting Limit	Metho
Lipids		0.93	%		
Solids		19.2	%		
Cadmium	<	-1	ug/Kg ww	15	
Lead	<	-1	ug/Kg ww	70	
Mercury		89	ug/Kg ww		
2,4'-DDD	<	-1	ug/Kg ww	5	
2,4'-DDE	<	-1	ug/Kg ww	5	
2,4'-DDT	<	-1	ug/Kg ww	5	
4,4'-DDD	<	-1	ug/Kg ww	5	
4,4'-DDE		8.2	ug/Kg ww		
4,4'-DDT	<	-1	ug/Kg ww	5	
Aldrin	<	-1	ug/Kg ww	2.5	
Alpha-BHC	<	-1	ug/Kg ww	2.5	
Beta-BHC	<	-1	ug/Kg ww	2.5	
Chlordane, Alpha-	<	-1	ug/Kg ww	2.5	
Chlordane, Gamma-	<	-1	ug/Kg ww	2.5	
Delta-BHC	<	-1	ug/Kg ww	2.5	
Dieldrin	<	-1	ug/Kg ww	5	
Endosulfan I	<	-1	ug/Kg ww	2.5	
Endosulfan II	<	-1	ug/Kg ww	5	
Endosulfan Sulfate	<	-1	ug/Kg ww	5	
Endrin	<	-1	ug/Kg ww	5	
Endrin Aldehyde	<	-1	ug/Kg ww	5	
Endrin Ketone	<	-1	ug/Kg ww	5	
Gamma-BHC (Lindane)	<	-1	ug/Kg ww	2.5	
Heptachlor	<	-1	ug/Kg ww	2.5	
Heptachlor Epoxide	<	-1	ug/Kg ww	2.5	
Methoxychlor	<	-1	ug/Kg ww	20	
Nonachlor, cis-	<	-1	ug/Kg ww	5	
Nonachlor, trans-	<	-1	ug/Kg ww	5	
Oxychlordane	<	-1	ug/Kg ww	5	
Pentachloroanisole	<	-1	ug/Kg ww	2.5	
Toxaphene	<	-1	ug/Kg ww	46	
Hexachlorobenzene	<	-1	ug/Kg ww	2.5	
Aroclor 1016	<	-1	ug/Kg ww	50	
Aroclor 1221	<	-1	ug/Kg ww	50	
Aroclor 1232	<	-1	ug/Kg ww	50	
Aroclor 1242	<	-1	ug/Kg ww	50	
Aroclor 1248	<	-1	ug/Kg ww	50	
Aroclor 1254	<	-1	ug/Kg ww	50	
Aroclor 1260	J	34	ug/Kg ww		
Total PCBs	J	34	ug/Kg ww		

Sample Date: **7/20/1999** **Lab ID #:** **901551002** **Fish Sample Number:** **901551002**

Indiana Department of Environmental
Office of Water Quality-Assessment Branch- Biological Studies
Fish Tissue Contaminant Results Summary

SiteID: UMK030-0026 **USGS Hydrologic** 07120001030050

Stream Name: Stone Lake **County** Laporte

Description: LAPORTE, IN **Latitude:** 41 36 42 **Longitude:** -86 44 47

Sample Date: 7/20/1999 **Lab ID #: 901551003** **Fish Sample Number: 901551003**

1 black crappie **Mean Length (mm)** **Mean Weight**

Skin-On Fillets, Scaleless **299** (299 - 299) **425** (425 - 425)

		Result		Reporting Limit	Metho
Lipids		1.1	%		
Solids		18.5	%		
Cadmium	<	-1	ug/Kg ww	15	
Lead	<	-1	ug/Kg ww	70	
Mercury		56	ug/Kg ww		
2,4'-DDD	<	-1	ug/Kg ww	5	
2,4'-DDE	<	-1	ug/Kg ww	5	
2,4'-DDT	<	-1	ug/Kg ww	5	
4,4'-DDD	<	-1	ug/Kg ww	5	
4,4'-DDE	J	4.1	ug/Kg ww		
4,4'-DDT	<	-1	ug/Kg ww	5	
Aldrin	<	-1	ug/Kg ww	2.5	
Alpha-BHC	<	-1	ug/Kg ww	2.5	
Beta-BHC	<	-1	ug/Kg ww	2.5	
Chlordane, Alpha-	<	-1	ug/Kg ww	2.5	
Chlordane, Gamma-	<	-1	ug/Kg ww	2.5	
Delta-BHC	<	-1	ug/Kg ww	2.5	
Dieldrin	<	-1	ug/Kg ww	5	
Endosulfan I	<	-1	ug/Kg ww	2.5	
Endosulfan II	<	-1	ug/Kg ww	5	
Endosulfan Sulfate	<	-1	ug/Kg ww	5	
Endrin	<	-1	ug/Kg ww	5	
Endrin Aldehyde	<	-1	ug/Kg ww	5	
Endrin Ketone	<	-1	ug/Kg ww	5	
Gamma-BHC (Lindane)	<	-1	ug/Kg ww	2.5	
Heptachlor	<	-1	ug/Kg ww	2.5	
Heptachlor Epoxide	<	-1	ug/Kg ww	2.5	
Methoxychlor	<	-1	ug/Kg ww	20	
Nonachlor, cis-	<	-1	ug/Kg ww	5	
Nonachlor, trans-	<	-1	ug/Kg ww	5	
Oxychlordane	<	-1	ug/Kg ww	5	
Pentachloroanisole	<	-1	ug/Kg ww	2.5	
Toxaphene	<	-1	ug/Kg ww	46	
Hexachlorobenzene	<	-1	ug/Kg ww	2.5	
Aroclor 1016	<	-1	ug/Kg ww	50	
Aroclor 1221	<	-1	ug/Kg ww	50	
Aroclor 1232	<	-1	ug/Kg ww	50	
Aroclor 1242	<	-1	ug/Kg ww	50	
Aroclor 1248	<	-1	ug/Kg ww	50	
Aroclor 1254	<	-1	ug/Kg ww	50	
Aroclor 1260	J	13	ug/Kg ww		
Total PCBs	J	13	ug/Kg ww		

Sample Date: 7/20/1999 **Lab ID #: 901551003** **Fish Sample Number: 901551003**

Indiana Department of Environmental
Office of Water Quality-Assessment Branch- Biological Studies
Fish Tissue Contaminant Results Summary

SiteID: UMK030-0026 **USGS Hydrologic** 07120001030050

Stream Name: Stone Lake **County** Laporte

Description: LAPORTE, IN **Latitude:** 41 36 42 **Longitude:** -86 44 47

Sample Date: **7/20/1999** **Lab ID #:** **901551004** **Fish Sample Number:** **901551004**

2 brown bullhead **Mean Length (mm)** **Mean Weight**
Skin-Off Fillets **313** (274 - 351) **454** (312 - 595)

		Result		Reporting Limit	Metho
Lipids		1.53	%		
Solids		16	%		
Cadmium	<	-1	ug/Kg ww	15	
Lead	<	-1	ug/Kg ww	70	
Mercury	<	-1	ug/Kg ww	50	
2,4'-DDD	<	-1	ug/Kg ww	5	
2,4'-DDE	<	-1	ug/Kg ww	5	
2,4'-DDT	<	-1	ug/Kg ww	5	
4,4'-DDD	J	1.7	ug/Kg ww		
4,4'-DDE		7.6	ug/Kg ww		
4,4'-DDT	<	-1	ug/Kg ww	5	
Aldrin	<	-1	ug/Kg ww	2.5	
Alpha-BHC	<	-1	ug/Kg ww	2.5	
Beta-BHC	<	-1	ug/Kg ww	2.5	
Chlordane, Alpha-	J	0.76	ug/Kg ww		
Chlordane, Gamma-	<	-1	ug/Kg ww	2.5	
Delta-BHC	<	-1	ug/Kg ww	2.5	
Dieldrin	<	-1	ug/Kg ww	5	
Endosulfan I	<	-1	ug/Kg ww	2.5	
Endosulfan II	<	-1	ug/Kg ww	5	
Endosulfan Sulfate	<	-1	ug/Kg ww	5	
Endrin	<	-1	ug/Kg ww	5	
Endrin Aldehyde	<	-1	ug/Kg ww	5	
Endrin Ketone	<	-1	ug/Kg ww	5	
Gamma-BHC (Lindane)	<	-1	ug/Kg ww	2.5	
Heptachlor	<	-1	ug/Kg ww	2.5	
Heptachlor Epoxide	<	-1	ug/Kg ww	2.5	
Methoxychlor	<	-1	ug/Kg ww	20	
Nonachlor, cis-	<	-1	ug/Kg ww	5	
Nonachlor, trans-	J	0.94	ug/Kg ww		
Oxychlordane	<	-1	ug/Kg ww	5	
Pentachloroanisole	<	-1	ug/Kg ww	2.5	
Toxaphene	<	-1	ug/Kg ww	46	
Hexachlorobenzene	<	-1	ug/Kg ww	2.5	
Aroclor 1016	<	-1	ug/Kg ww	50	
Aroclor 1221	<	-1	ug/Kg ww	50	
Aroclor 1232	<	-1	ug/Kg ww	50	
Aroclor 1242	<	-1	ug/Kg ww	50	
Aroclor 1248	<	-1	ug/Kg ww	50	
Aroclor 1254	<	-1	ug/Kg ww	50	
Aroclor 1260	J	46	ug/Kg ww		
Total PCBs	J	46	ug/Kg ww		

Sample Date: **7/20/1999** **Lab ID #:** **901551004** **Fish Sample Number:** **901551004**

APPENDIX E

FIELD SURVEY NOTES AND DATA

DATE:	July 19, 200	Collected by Purdue North Centra				
Lake Name	Clear Lake	Collectors	Mitchell Alix, Robin Scribailo, and Amanda Laka			
Lake ID:	INK01P1100_0					

Depth Below Surface (m)	Temp °C	DO (%)	DO (mg/L)	Conductivit uS
1	27.0	73.8	5.55	803.0
2	25.5	15.9	1.23	926.0
3	24.2	2.4	0.19	981.0

Overall Depth:	2.3 m (7.5 ft
Secchi Disk Depth	2.0 m (6.6 ft)

Light measurements			
In Air	0.6	Units:	3000
3 ft below Surface:	0.06	Units:	3000
1% Depth:	0.86 m (2.8 ft	Units:	300C

pH Measurements		Temp (°C)
1 m Below Surface	9.33	28.C
1m Above Bottom:	9.13	26.5

		US STATE PLANE (1983) NAD 83 CONUS US survey Feet				DEPTH		OVERALL			
ID	DATE	EAST	NORTH	No. TAXA	SEDIMENT	Meters	Feet	DENSITY	CERDEM	DENSITY	VOUCHER
1	7/10/2006	3050610.0	2320884.0	3	Muck	0.6	2.0	4	1	1	yes
2	7/10/2006	3050895.0	2320599.0	2	Sand	0.0	0.1	1	0	0	0
3	7/10/2006	3050895.0	2320884.0	2	Muck	0.8	2.6	5	0	0	0
4	7/10/2006	3050895.0	2321169.0	2	Muck	1.1	3.6	5	0	0	0
5	7/10/2006	3050895.0	2321454.0	3	Muck	1.1	3.6	5	1	1	0
6	7/10/2006	3050895.0	2321739.0	5	Muck	1.0	3.3	5	0	0	0
7	7/10/2006	3050895.0	2322024.0	1	Muck	0.3	1.0	1	0	0	0
8	7/10/2006	3051180.0	2320029.0	3	Muck	2.3	7.5	2	1	1	0
9	7/10/2006	3051180.0	2320314.0	3	Muck	0.6	2.0	5	0	0	0
10	7/10/2006	3051180.0	2320599.0	3	Muck	1.0	3.3	5	1	1	0
11	7/10/2006	3051180.0	2320884.0	1	Muck	1.5	4.9	5	0	0	0
12	7/10/2006	3051180.0	2321169.0	1	Muck	1.5	4.9	5	0	0	0
13	7/10/2006	3051180.0	2321454.0	4	Muck	1.7	5.6	5	0	0	0
14	7/10/2006	3051180.0	2321739.0	4	Muck	1.5	4.9	5	1	1	0
15	7/10/2006	3051180.0	2322024.0	1	Muck	1.3	4.3	4	0	0	0
16	7/10/2006	3051180.0	2322309.0	3	Muck	1.0	3.3	4	0	0	0
17	7/10/2006	3051465.0	2320029.0	2	Muck	2.5	8.2	2	1	1	0
18	7/10/2006	3051465.0	2320314.0	2	Muck	1.8	5.9	5	1	1	0
19_DELETED	7/10/2006	3050206.0	2322536.0								
20	7/10/2006	3051465.0	2320599.0	3	Muck	1.8	5.9	5	1	1	0
21	7/10/2006	3051465.0	2320884.0	2	Muck	1.8	5.9	5	1	1	0
22	7/10/2006	3051465.0	2321169.0	2	Muck	1.7	5.6	4	1	1	0
23	7/10/2006	3051465.0	2321454.0	3	Muck	1.7	5.6	3	1	1	0
24	7/10/2006	3051465.0	2321739.0	2	Muck	1.8	5.7	5	1	1	0
25	7/10/2006	3051465.0	2322024.0	2	Muck	1.6	5.2	5	0	0	0
26	7/10/2006	3051465.0	2322309.0	3	Muck	1.2	3.9	5	1	1	0
27	7/10/2006	3051750.0	2320029.0	1	Muck	1.4	4.6	5	0	0	0
28	7/12/2006	3051750.0	2320314.0	2	Muck	1.6	5.2	5	1	1	0
29	7/12/2006	3051750.0	2320599.0	1	Muck	1.7	5.6	5	0	0	0
30	7/12/2006	3051750.0	2320884.0	1	Muck	1.7	5.6	4	0	0	0
31	7/12/2006	3051750.0	2321169.0	2	Muck	1.8	5.9	5	1	1	0
32	7/12/2006	3051750.0	2321454.0	2	Muck	2.0	6.6	5	0	0	0
33	7/12/2006	3051750.0	2321739.0	1	Muck	2.0	6.6	5	0	0	0
34	7/12/2006	3051750.0	2322024.0	3	Muck	1.6	5.2	5	1	1	0
35	7/12/2006	3051750.0	2322309.0	2	Muck	1.0	3.3	5	0	0	0
36	7/12/2006	3052035.0	2320029.0	2	Muck	0.8	2.6	5	0	0	0
37	7/12/2006	3052035.0	2320314.0	3	Muck	1.9	6.2	5	0	0	0
38	7/12/2006	3052035.0	2320599.0	2	Muck	1.8	5.7	5	0	0	0
39	7/24/2006	3052035.0	2320884.0	2	Muck	1.7	5.6	5	1	1	0
40	7/24/2006	3052035.0	2321169.0	3	Muck	1.9	6.2	5	1	1	0
41	7/24/2006	3052035.0	2321454.0	2	Muck	1.9	6.2	5	1	1	0
42	7/24/2006	3052035.0	2321739.0	2	Muck	1.8	5.9	4	1	1	0
43	7/24/2006	3052035.0	2322024.0	3	Muck	1.6	5.2	4	1	1	0
44	7/24/2006	3052035.0	2322309.0	4	Muck	0.4	1.3	5	0	0	0
45	7/24/2006	3052320.0	2320314.0	3	Muck	1.2	3.9	5	1	1	0
46	7/24/2006	3052320.0	2320599.0	1	Muck	1.7	5.4	5	0	0	0
47	7/24/2006	3052320.0	2320884.0	2	Muck	1.7	5.6	5	1	1	0
48	7/24/2006	3052320.0	2321169.0	1	Muck	1.3	4.3	5	0	0	0
49	7/24/2006	3052320.0	2321454.0	2	Sand	0.5	1.6	1	0	0	0
50_DELETED	7/24/2006	3052320.0	2321739.0	0							
51_DELETED	7/24/2006	3052320.0	2322024.0	0							
52	7/24/2006	3052605.0	2320599.0	2	Muck	0.9	3.0	1	1	1	0
53	7/24/2006	3052605.0	2320884.0	2	Muck	0.7	2.3	4	0	0	0

3 points deleted

DELETED Not sampled because point was on shore

Contour (ft)	Samples
0 to 5	28
5 to 10	22

ID	DENSITY	VOUCHER	CHABRA	DENSITY	VOUCHER	ELOCAN	DENSITY	VOUCHER	HETDUB	DENSITY
1	1	yes	0	0	0	1	1	0	0	0
2	0	0	1	1	yes	0	0	0	0	0
3	0	0	0	0	0	1	1	0	0	0
4	0	0	0	0	0	1	1	0	0	0
5	1	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	1	1	0	0	0
7	0	0	0	0	0	0	0	0	0	0
8	1	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	1	1	0	0	0
10	1	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0
14	1	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	1	1	yes	0	0
17	1	0	0	0	0	0	0	0	0	0
18	1	0	0	0	0	0	0	0	0	0
19_DELETED								0		
20	1	0	0	0	0	1	1	0	0	0
21	1	0	0	0	0	0	0	0	0	0
22	1	0	0	0	0	0	0	0	0	0
23	1	0	0	0	0	0	0	0	0	0
24	1	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	1	1	0	0	0
26	1	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0
28	1	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0
31	1	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0
34	1	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	1	1	0	0	0
36	0	0	0	0	0	1	1	0	0	0
37	0	0	0	0	0	1	1	0	0	0
38	0	0	0	0	0	0	0	0	0	0
39	1	0	0	0	0	0	0	0	0	0
40	1	0	0	0	0	0	0	0	0	0
41	1	0	0	0	0	0	0	0	0	0
42	1	0	0	0	0	0	0	0	0	0
43	1	0	0	0	0	0	0	0	0	0
44	0	0	0	0	0	1	1	0	1	1
45	1	0	0	0	0	1	1	0	0	0
46	0	0	0	0	0	0	0	0	0	0
47	1	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0
49	0	0	0	0	0	0	0	0	0	0
50_DELETED										
51_DELETED										
52	1	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0	0

ID	VOUCHER	MYR_	DENSITY	VOUCHER	NAJFLE	DENSITY	VOUCHER	NAJMIN	DENSITY	VOUCHER
1	0	1	4	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	1	1	0
3	0	1	4	0	0	0	0	0	0	0
4	0	1	4	0	0	0	0	0	0	0
5	0	1	5	0	1	1	0	0	0	0
6	0	1	5	0	1	1	0	0	0	0
7	0	0	0	0	0	0	0	1	1	0
8	0	1	2	0	1	1	0	0	0	0
9	0	1	5	0	0	0	0	0	0	0
10	0	1	5	0	0	0	0	0	0	0
11	0	1	5	0	0	0	0	0	0	0
12	0	1	5	0	0	0	0	0	0	0
13	0	1	5	0	1	1	yes	0	0	0
14	0	1	5	0	1	1	yes	0	0	0
15	0	1	4	0	0	0	0	0	0	0
16	0	1	4	yes	0	0	0	0	0	0
17	0	1	2	0	0	0	0	0	0	0
18	0	1	5	0	0	0	0	0	0	0
19_DELETED				0						
20	0	1	5	0	0	0	0	0	0	0
21	0	1	5	0	0	0	0	0	0	0
22	0	1	4	0	0	0	0	0	0	0
23	0	1	3	0	1	1	0	0	0	0
24	0	1	5	0	0	0	0	0	0	0
25	0	1	5	0	1	0	0	0	0	0
26	0	1	5	0	1	1	0	0	0	0
27	0	1	5	0	0	0	0	0	0	0
28	0	1	5	0	0	0	0	0	0	0
29	0	1	5	0	0	0	0	0	0	0
30	0	1	4	0	0	0	0	0	0	0
31	0	1	5	0	0	0	0	0	0	0
32	0	1	5	0	0	0	0	0	0	0
33	0	1	5	0	0	0	0	0	0	0
34	0	1	5	0	0	0	0	0	0	0
35	0	1	5	0	0	0	0	0	0	0
36	0	1	5	0	0	0	0	0	0	0
37	0	1	5	0	0	0	0	0	0	0
38	0	1	5	0	0	0	0	0	0	0
39	0	1	5	0	0	0	0	0	0	0
40	0	1	5	0	0	0	0	0	0	0
41	0	1	5	0	0	0	0	0	0	0
42	0	1	4	0	0	0	0	0	0	0
43	0	1	3	0	0	0	0	0	0	0
44	yes	1	5	0	0	0	0	1	1	0
45	0	1	5	0	0	0	0	0	0	0
46	0	1	5	0	0	0	0	0	0	0
47	0	1	5	0	0	0	0	0	0	0
48	0	1	5	0	0	0	0	0	0	0
49	0	0	0	0	1	1	yes	1	1	yes
50_DELETED										
51_DELETED										
52	0	1	1	0	0	0	0	0	0	0
53	0	1	4	0	0	0	0	0	0	0

ID	POTCRI	DENSITY	VOUCHER	POTILL	DENSITY	VOUCHER	POTPUT	DENSITY	VOUCHER	RANAQD
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0
6	0	0	0	1	1	0	1	1	0	0
7	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	1
10	0	0	0	1	2	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0
13	1	1	yes	0	0	0	1	1	yes	0
14	0	0	0	1	1	yes	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0
19_DELETED										
20	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0
32	0	0	0	1	1	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	1	1	0	0
35	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0
37	1	1	0	0	0	0	0	0	0	0
38	1	1	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0	0
40	1	1	0	0	0	0	0	0	0	0
41	0	0	0	0	0	0	0	0	0	0
42	0	0	0	1	1	0	0	0	0	0
43	1	1	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0
46	0	0	0	0	0	0	0	0	0	0
47	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0
49	0	0	0	0	0	0	0	0	0	0
50_DELETED										
51_DELETED										
52	0	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0	0

ID	DENSITY	VOUCHER	STUPEC	DENSITY	VOUCHER	
1	0	0	0	0	0	
2	0	0	0	0	0	
3	0	0	0	0	0	
4	0	0	0	0	0	
5	0	0	0	0	0	
6	0	0	0	0	0	
7	0	0	0	0	0	
8	0	0	0	0	0	
9	1	0	0	0	0	
10	0	0	0	0	0	
11	0	0	0	0	0	
12	0	0	0	0	0	
13	0	0	0	0	0	
14	0	0	0	0	0	
15	0	0	0	0	0	
16	0	0	1	1	yes	
17	0	0	0	0	0	ALGAE
18	0	0	0	0	0	ALGAE
19_DELETED					0	
20	0	0	0	0	0	
21	0	0	0	0	0	
22	0	0	0	0	0	
23	0	0	0	0	0	
24	0	0	0	0	0	
25	0	0	0	0	0	
26	0	0	0	0	0	
27	0	0	0	0	0	
28	0	0	0	0	0	
29	0	0	0	0	0	ALGAE
30	0	0	0	0	0	
31	0	0	0	0	0	
32	0	0	0	0	0	
33	0	0	0	0	0	
34	0	0	0	0	0	
35	0	0	0	0	0	
36	0	0	0	0	0	
37	0	0	0	0	0	
38	0	0	0	0	0	
39	0	0	0	0	0	
40	0	0	0	0	0	
41	0	0	0	0	0	
42	0	0	0	0	0	
43	0	0	0	0	0	
44	0	0	0	0	0	
45	0	0	0	0	0	
46	0	0	0	0	0	
47	0	0	0	0	0	
48	0	0	0	0	0	ALGAE
49	0	0	0	0	0	
50_DELETED						
51_DELETED						
52	0	0	0	0	0	
53	0	0	0	0	0	ALGAE

	CERDEM	CHABRA	ELOCAN	HETDUB	MYR_	NAJFLE	NAJMIN	POTCRI	POTILL	POTPUT	RANAQD	STUPEC
Total observations	24	1	13	1	47	9	4	5	5	3	1	1
Frequency	0.48	0.02	0.26	0.02	0.94	0.18	0.08	0.1	0.1	0.06	0.02	0.02
Frequency (%)	48.0	2.0	26.0	2.0		18.0	8.0	10.0	10.0	6.0	2.0	2.0
Relative frequency	0.211	0.009	0.114	0.009	0.412	0.079	0.035	0.044	0.044	0.026	0.009	0.009
Relative frequency (%)	21.1	0.9	11.4	0.9	41.2	7.9	3.5	4.4	4.4	2.6	0.9	0.9

Mean No. Taxa

2.26

	CERDEM	CHABRA	ELOCAN	HETDUB	MYR_	NAJFLE	NAJMIN	POTCRI	POTILL	POTPUT	RANAQD	STUPEC
Total No. Observations	24	1	13	1	47	9	4	5	5	3	1	1
Total density	24	1	13	1	212	8	4	5	6	3	1	1
Average density	1.00	1.00	1.00	1.00	4.51	0.89	1.00	1.00	1.20	1.00	1.00	1.00

Overall
Mean density
4.36

	CERDEM	CHABRA	ELOCAN	HETDUB	MYR?	NAJFLE	NAJMIN	POTCRI	POTILL	POTPUT	RANAQD	STUPEC	Csum	N	Cmean	I
Rothrock	1		3	4		5			7	4	7	3	34	8	4.3	12.0
A & S	1	5	3	5		5			4	3	5	2	33	9	3.7	11.0

DATE:	July 19, 2006	*Collected by Purdue North Central*
Lake Name:	Harris Lake	Collectors: Mitchell Alix, Robin Scribailo, and Amanda Lakatos
Lake ID:		

Depth Below Surface (m)	Temp °C	DO (%)	DO (mg/L)	Conductivity uS
0	30.1	73.4	5.65	239.1
0.5	26.9	6.2	0.53	267.4
1	26.3	0	0.05	287.9

Overall Depth:		1.0 m (3.3 ft)	
Secchi Disk Depth		0.60 m (2.0 ft)	
Light measurements			
In Air	0.18	**Units:**	3000
3 ft below Surface:	0	**Units:**	3000
1% Depth:	0.28 m	**Units:**	3000
pH Measurements		**Temp (°C)**	
At Surface:	7.42	30.1	
1ft Above Bottom:	6.98	27.1	

		US STATE PLANE NAD 83 (USft)				DEPTH		OVERALL							
ID	DATE	Easting	Northing	No. TAXA	SEDIMENT	Meters	Feet	DENSITY	CERDEM	DENSITY	VOUCHER	ELOCAN	DENSITY	VOUCHER	NAJFLE
1	8/2/2006	3046888.5	2319639.1	1	Muck	1.2	3.9	5	1	5	0	0	0	0	0
2	8/2/2006	3046883.3	2319691.8	1	Muck	1.4	4.6	5	1	5	0	0	0	0	0
3	8/2/2006	3046868.0	2319739.5	1	Muck	1.4	4.6	5	1	5	0	0	0	0	0
4	8/2/2006	3046878.8	2319780.0	1	Muck	1.5	4.9	5	1	5	0	0	0	0	0
5	8/2/2006	3046889.1	2319816.7	1	Muck	1.3	4.3	5	1	5	0	0	0	0	0
6	8/2/2006	3046884.1	2319853.7	1	Muck	1.2	3.9	5	1	5	0	0	0	0	0
7	8/2/2006	3046896.2	2319901.9	1	Muck	1.5	4.9	5	1	5	0	0	0	0	0
8	8/2/2006	3046897.0	2319971.2	0	Muck	1.4	4.6	0	0	0	0	0	0	0	0
9	8/2/2006	3046882.6	2320004.4	1	Muck	1.3	4.3	5	1	5	0	0	0	0	0
10	8/2/2006	3046909.2	2320053.0	2	Muck	1.5	4.9	5	1	5	0	0	0	0	0
11	8/2/2006	3046905.2	2320068.1	2	Muck	1.5	4.9	5	1	5	0	1	1	0	0
12	8/2/2006	3046899.4	2320096.1	1	Muck	1.5	4.9	1	1	1	0	0	0	0	0
13	8/2/2006	3046901.3	2320136.7	2	Muck	1.3	4.3	4	1	4	0	1	1	0	0
14	8/2/2006	3046900.3	2320194.9	1	Muck	1.5	4.9	5	1	5	0	0	0	0	0
15	8/2/2006	3046927.8	2320196.1	2	Muck	0.5	1.6	1	1	1	0	0	0	0	0
16	8/2/2006	3046933.8	2320275.9	3	Muck	1.5	4.9	5	1	3	0	1	1	0	0
17	8/2/2006	3046923.6	2320303.7	3	Sand	0.2	0.7	1	1	1	0	0	0	0	1
18	8/2/2006	3046921.4	2320374.1	0	Silt/Sand	0.3	1.0	0	0	0	0	0	0	0	0
19	8/2/2006	3046990.5	2320311.3	4	Sand	0.6	2.0	4	1	2	0	1	2	0	0
20	8/2/2006	3046999.2	2320328.2	1	Muck	1.3	4.3	1	1	1	0	0	0	0	0
21	8/2/2006	3047035.6	2320366.7	3	Sand	0.5	1.6	4	1	1	0	1	2	0	0
22	8/2/2006	3047060.0	2320361.1	2	Muck	1.4	4.6	2	1	1	0	0	0	0	0
23	8/2/2006	3047115.4	2320365.7	1	Muck	1.4	4.6	1	1	1	0	0	0	0	0
24	8/2/2006	3047154.2	2320390.5	4	Sand	0.2	0.7	1	0	0	0	1	1	0	1
25	8/2/2006	3047219.9	2320346.3	1	Muck	1.3	4.3	1	1	1	0	0	0	0	0
26	8/2/2006	3047238.7	2320334.5	4	Muck	1.2	3.9	5	1	3	0	1	1	yes	0
27	8/2/2006	3047267.4	2320317.3	2	Muck	1.5	4.9	1	1	1	0	1	1	0	0
28	8/2/2006	3047296.7	2320287.6	1	Muck	1.4	4.6	2	1	2	0	0	0	0	0
29	8/2/2006	3047376.6	2320240.9	1	Muck	1.6	5.2	1	1	1	yes	0	0	0	0
30	8/2/2006	3047420.4	2320226.5	1	Muck	1.3	4.3	5	1	5	0	0	0	0	0

Contour (ft)	Samples
0 to 5	29
5 to 10	1

ID	DENSITY	VOUCHER	POTFOF	DENSITY	VOUCHER	POTPUT	DENSITY	VOUCHER	POTZOS	DENSITY	VOUCHER	SAGRIG	DENSITY	VOUCHER
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	1	1	yes	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	1	1	yes	0	0	0	0	0	0
17	1	yes	1	1	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	1	1	0	0	0	0	1	1	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	1	2	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	1	1	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	1	0	1	1	0	0	0	0	0	0	0	1	1	yes
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	1	2	0	1	1	yes	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0

ID	UTRMAC	DENSITY	VOUCHER
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0
7	0	0	0
8	0	0	0
9	0	0	0
10	1	1	yes
11	0	0	0
12	0	0	0
13	0	0	0
14	0	0	0
15	0	0	0
16	0	0	0
17	0	0	0
18	0	0	0
19	0	0	0
20	0	0	0
21	0	0	0
22	0	0	0
23	0	0	0
24	0	0	0
25	0	0	0
26	0	0	0
27	0	0	0
28	0	0	0
29	0	0	0
30	0	0	0

	CERDEM	ELOCAN	NAJFLE	POTFOF	POTPUT	POTZOS	SAGRIG	UTRMAC
Total observations	27	8	2	5	3	2	1	1
Frequency	0.90	0.27	0.07	0.17	0.10	0.07	0.03	0.03
Frequency (%)	90.0	26.7	6.7	16.7	10.0	6.7	3.3	3.3
Relative frequency	0.551	0.163	0.041	0.102	0.061	0.041	0.020	0.020
Relative frequency (%)	55.1	16.3	4.1	10.2	6.1	4.1	2.0	2.0

Mean No. Taxa

1.63

	CERDEM	ELOCAN	NAJFLE	POTFOF	POTPUT	POTZOS	SAGRIG	UTRMAC
Total No. Observations	27	8	2	5	3	2	1	1
Total density	84	10	2	6	4	2	1	1
Average density	3.11	1.25	1.00	1.20	1.33	1.00	1.00	1.00

Overall
Mean density
3.17

	CERDEM	ELOCAN	NAJFLE	POTFOF	POTPUT	POTZOS	SAGRIG	UTRMAC	Csum	N	Cmean	I
Rothrock	1	3	5	4	4	8	10	5	40	8	5.0	14.1
A & S	1	3	5	4	3	4	8	4	32	8	4.0	11.3

DATE:	July 19, 2006	*Collected by Purdue North Central*
Lake Name:	Lilly Lake	Collectors: Mitchell Alix, Robin Scribailo, and Amanda Lakatos
Lake ID:	INK01P1033_00	

Depth Below Surface (m)	Temp °C	DO (%)	DO (mg/L)	Conductivity uS
1	29.1	101.0	7.88	686.0
2	25.4	57.3	4.99	728.0
3	21.5	2.5	0.20	830.0
4	17.2	1.8	0.18	822.0
5	12.2	1.6	0.17	865.0

Overall Depth:	5.5 m (18.0 ft)
Secchi Disk Depth	0.8 m (2.6 ft)

Light measurements			
In Air	0.74	Units:	3000
3 ft below Surface:	0.02	Units:	3000
1% Depth:	0.5 m	Units:	3000

pH Measurements		Temp (°C)
1 m Below Surface:	9.3	29.1
1m Above Bottom:	7.2	12.7

ID	DATE	US STATE PLANE NAD 83 (USft) Easting	Northing	No. TAXA	SEDIMENT	DEPTH Meters	Feet	OVERALL DENSITY	CERDEM	DENSITY	VOUCHER	HETDUB	DENSITY
1_DELETED	8/9/2006	3048486.0	2317671.0	0	on shore								
2	8/9/2006	3048486.0	2317866.0	0	Muck	0.1	0.3	0	0	0	0	0	0
3	8/9/2006	3048486.0	2318061.0	1	Muck	0.4	1.3	1	1	1	0	0	0
4	8/9/2006	3048486.0	2318256.0	2	Muck	0.3	1.0	1	1	1	0	0	0
5	8/9/2006	3048486.0	2318451.0	1	Muck	1.2	3.9	1	1	1	0	0	0
6	8/9/2006	3048486.0	2318646.0	0	Muck	0.1	0.3	0	0	0	0	0	0
7	8/9/2006	3048486.0	2318841.0	0	Muck	0.4	1.3	0	0	0	0	0	0
8	8/9/2006	3048681.0	2317671.0	0	Muck	0.3	1.0	0	0	0	0	0	0
9_DELETED	8/9/2006	3048681.0	2317866.0	0	on shore								
10	8/9/2006	3048681.0	2318061.0	3	Muck	0.7	2.3	1	1	1	0	0	0
11	8/9/2006	3048681.0	2318256.0	1	Muck	0.6	2.0	1	1	1	0	0	0
12	8/9/2006	3048681.0	2318451.0	1	Muck	0.4	1.3	1	1	1	0	0	0
13	8/9/2006	3048681.0	2318646.0	2	Muck	0.9	3.0	3	1	3	0	0	0
14	8/9/2006	3048681.0	2318841.0	1	Muck	0.8	2.6	1	1	1	0	0	0
15	8/9/2006	3048681.0	2319036.0	0	Muck	0.5	1.6	0	0	0	0	0	0
16	8/9/2006	3048876.0	2317671.0	1	Muck	0.1	0.3	1	1	1	0	0	0
17	8/9/2006	3048876.0	2318061.0	1	Muck	0.2	0.7	1	0	0	0	0	0
18	8/9/2006	3048876.0	2318451.0	0	Muck	0.4	1.3	0	0	0	0	0	0
19	8/9/2006	3048876.0	2318646.0	1	Muck	0.6	2.0	1	1	1	0	0	0
20	8/9/2006	3048876.0	2318841.0	3	Muck	0.6	2.0	3	1	1	0	1	1
21	8/9/2006	3048876.0	2319036.0	2	Muck	1.0	3.3	1	1	1	0	0	0
22_DELETED	8/9/2006	3049071.0	2318256.0	0	on shore								
23	8/9/2006	3049071.0	2318451.0	0	Muck	0.2	0.7	0	0	0	0	0	0
24	8/9/2006	3049071.0	2318646.0	2	Muck	0.9	3.0	5	1	2	0	0	0
25	8/9/2006	3049071.0	2318841.0	0	Muck	5.9	19.4	0	0	0	0	0	0
26	8/9/2006	3049071.0	2319036.0	1	Muck	2.7	8.9	1	1	1	0	0	0
27	8/9/2006	3049266.0	2318646.0	2	Muck	0.6	2.0	5	0	0	0	0	0
28	8/9/2006	3049266.0	2318841.0	0	Muck	5.9	19.4	0	0	0	0	0	0
29	8/9/2006	3049266.0	2319036.0	4	Muck	0.9	3.0	5	1	1	0	1	1
30_DELETED	8/9/2006	3049461.0	2318841.0	0	on shore								
31	8/2/2006	3049461.0	2319036.0	0	Rock	0.3	1.0	0	0	0	0	0	0

4 points deleted

DELETED Not sampled because point was on shore

Contour (ft)	Samples
0 to 5	24
5 to 10	1
10 to 15	0
15 to 20	2

ID	VOUCHER	MYR?	DENSITY	VOUCHER	NAJMIN	DENSITY	VOUCHER	UTRGIB	DENSITY	VOUCHER	UTRMAC	DENSITY	VOUCHER
1_DELETED													
2	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	1	1	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0
9_DELETED													
10	0	0	0	0	0	0	0	1	1	0	1	1	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	1	1	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	1	1	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	1	1	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	1	1	0	0	0	0	0	0	0
22_DELETED													
23	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	1	3	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	1	2	0	1	3	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	1	2	0	1	2	0	0	0	0	0	0	0
30_DELETED													
31	0	0	0	0	0	0	0	0	0	0	0	0	0

	CERDEM	HETDUB	MYR_?	NAJMIN	UTRGIB	UTRMAC
Total observations	15	2	5	5	1	1
Frequency	0.56	0.07	0.19	0.19	0.04	0.04
Frequency (%)	55.6	7.4	18.5	18.5	3.7	3.7
Relative frequency	0.517	0.069	0.172	0.172	0.034	0.034
Relative frequency (%)	51.7	6.9	17.2	17.2	3.4	3.4

<u>Mean No. Taxa</u>

1.07

	CERDEM	HETDUB	MYR_?	NAJMIN	UTRGIB	UTRMAC
Total No. Observations	15	2	5	5	1	1
Total density	18	2	9	8	1	1
Average density	1.2	1.0	1.8	1.6	1.0	1.0

Overall
Mean density
1.22

	CERDEM	HETDUB	MYR_?	NAJMIN	UTRGIB	UTRMAC	Csum	N	Cmean	I
Rothrock	1	4			4	5	14	4	3.5	7.0
A & S	1	5			3	4	13	4	3.3	6.5

TAXON	$C_{Rothrock}$	$C_{A\&S}$	Rothrock N	Rothrock C_{mean}	Rothrock I	A & S N	A & S C_{mean}	A & S I
ALISUB	2	2	15	3.5	13.4	16	2.9	11.8
CERDEM	1	1						
CYPBIP	3	3						
CYPODO	1	1						
ELEOBT	1	1						
LEMMIO	3	3						
NITFLE		4						
NUPADV	6	3						
NYMODT	6	5						
PONCOR	5	6						
POTFOF	4	4						
SAG?								
SPA?								
SPIPOL	5	3						
TYPLAT	1	1						
UTRGIB	4	3						
UTRMAC	5	4						
WOACOL	5	3						
C_{SUM}	**52**	**47**						

	CERDEM	LEMMIO	NITFLE	NUPADV	NYMODT	PONCOR	POTFOF	SPA?	SPIPOL	UTRGIB	UTRMAC	WOACOL	Csum	N	Cmean	I
Rothrock	1	3		6	6	5	4		5	4	5	5	44	10	4.4	13.9
A & S	1	3	4	3	5	6	4		3	3	4	3	39	11	3.5	11.8

DATE:	July 20, 200	Collected by Purdue North Centra	
Lake Name	Pine Lak	Collectors	Robin Scribailo, Mitchell Alix, and Amanda Laka
Lake ID:			

Depth Below Surface (m)	Temp °C	DO (%)	DO (mg/L)	Conductivity uS
1	27.4	85.2	6.70	303.80
2	27.4	81.9	6.47	304.00
3	27.3	78.4	6.28	304.20
4	26.8	71	5.70	307.20
5	25.2	63.3	5.25	312.30
6	21.5	41	3.59	313.30
7	19.2	15.5	1.43	313.30
8	15.5	0.3	0.03	313.70
9	12.8	0.2	0.02	325.00
10	11.4	0.2	0.02	332.70
11	10.7	0.2	0.02	337.00
12	10.6	0.1	0.02	338.30

Overall Depth:	43 ft		
Secchi Disk Depth	4.5m		
Light measurements			
In Air	0.14	Units:	3000
3 ft below Surface:	0.04	Units:	3000
1% Depth:	10.5	Units:	3000
pH Measurements		Temp (° C)	
1 m Below Surface	8.24	27.6	
1m Above Bottom:	7.24	12.1	

ID	DATE	US STATE PLANE NAD 83 (USft) Easting	Northing	No. TAXA	SEDIMENT	DEPTH Meters	Feet	OVERALL DENSITY	BIDBEC	DENSITY
1_DELETED	8/15/2006	3041251.0	2323166.0							
2_DELETED	8/15/2006	3041251.0	2323446.0							
3_DELETED	8/15/2006	3041531.0	2322326.0							
4	8/15/2006	3041531.0	2322606.0	5	Muck	0.5	1.6	5	0	0
5	8/15/2006	3041531.0	2322886.0	6	Muck	0.4	1.3	3	0	0
6_DELETED	8/15/2006	3041531.0	2323166.0							
7_DELETED	8/15/2006	3041531.0	2323446.0							
8	8/15/2006	3041531.0	2323726.0	2	Muck	0.6	2.0	1	0	0
9	8/15/2006	3041811.0	2322326.0	3	Muck	0.4	1.3	5	0	0
10	8/15/2006	3041811.0	2322606.0	2	Muck	0.6	2.0	5	0	0
11	8/15/2006	3041811.0	2322886.0	4	Muck	0.3	1.0	5	0	0
12_DELETED	8/15/2006	3041811.0	2323166.0							
13_DELETED	8/15/2006	3041811.0	2323446.0							
14	8/23/2006	3041811.0	2325406.0	2	Muck	0.3	1.0	1	0	0
15_DELETED	8/21/2006	3041811.0	2325686.0							
16	8/15/2006	3042091.0	2322046.0	5	Muck	0.3	1.0	5	0	0
17	8/15/2006	3042091.0	2322326.0	1	Muck	0.6	2.0	1	0	0
18	8/15/2006	3042091.0	2322606.0	1	Muck	0.7	2.3	1	0	0
19	8/15/2006	3042091.0	2322886.0	3	Muck	0.6	2.0	5	0	0
20	8/23/2006	3042091.0	2325406.0	2	Muck	0.7	2.3	2	0	0
21	8/23/2006	3042091.0	2325966.0	6	Muck	0.5	1.6	5	1	1
22	8/23/2006	3042091.0	2325686.0	1	Muck	0.9	3.0	1	0	0
23	8/15/2006	3042371.0	2322046.0	5	Muck	0.8	2.6	3	0	0
24	8/15/2006	3042371.0	2322326.0	1	Muck	0.8	2.6	1	0	0
25	8/15/2006	3042371.0	2322606.0	1	Muck	0.8	2.6	1	0	0
26	8/15/2006	3042371.0	2322886.0	1	Muck	0.8	2.6	1	0	0
27	8/23/2006	3042371.0	2325126.0	2	Muck	0.8	2.6	3	0	0
28	8/23/2006	3042371.0	2325406.0	2	Muck	1.0	3.3	2	0	0
29	8/23/2006	3042371.0	2325686.0	3	Muck	1.0	3.3	3	0	0
30	8/23/2006	3042371.0	2325966.0	1	Sand	0.3	1.0	1	0	0
31_DELETED	8/15/2006	3042651.0	2321486.0							
32	8/15/2006	3042651.0	2321766.0	3	Muck	1.0	3.3	4	0	0
33	8/15/2006	3042651.0	2322046.0	4	Muck	1.1	3.6	1	0	0
34	8/15/2006	3042651.0	2322326.0	1	Muck	1.1	3.6	1	0	0
35	8/15/2006	3042651.0	2322606.0	1	Muck	0.9	3.0	1	0	0
36	8/15/2006	3042651.0	2322886.0	3	Muck	0.8	2.6	4	0	0
37	8/23/2006	3042651.0	2323726.0	4	Muck	0.4	1.3	3	0	0
38	8/23/2006	3042651.0	2324006.0	6	Muck	0.5	1.6	2	0	0
39	8/23/2006	3042651.0	2324286.0	5	Muck	0.6	2.0	1	0	0
40	8/23/2006	3042651.0	2325126.0	4	Muck	0.9	3.0	4	0	0
41	8/23/2006	3042651.0	2325406.0	0	Muck	5.8	19.0	0	0	0
42	8/23/2006	3042651.0	2325686.0	1	Muck	4.4	14.4	2	0	0
43	8/23/2006	3042651.0	2325966.0	4	Muck	1.3	4.3	4	0	0
44	8/23/2006	3042651.0	2326246.0	4	Muck	1.1	3.6	3	1	1
45	8/21/2006	3042651.0	2326526.0	5	Sand	0.5	1.6	3	0	0
46	8/15/2006	3042931.0	2320926.0	4	Muck	0.6	2.0	3	0	0
47	8/15/2006	3042931.0	2321206.0	2	Muck	0.9	3.0	4	0	0
48	8/15/2006	3042931.0	2321486.0	7	Muck	1.1	3.6	3	1	1
49	8/15/2006	3042931.0	2321766.0	4	Muck	1.1	3.6	3	0	0
50	8/15/2006	3042931.0	2322046.0	4	Muck	1.1	3.6	2	0	0
51	8/15/2006	3042931.0	2322326.0	2	Muck	1.1	3.6	1	0	0
52	8/15/2006	3042931.0	2322606.0	0	Muck	1.2	3.9	0	0	0
53	8/15/2006	3042931.0	2322886.0	2	Muck	0.9	3.0	5	0	0
54	8/23/2006	3042931.0	2323726.0	3	Muck	0.5	1.6	4	0	0
55	8/23/2006	3042931.0	2324006.0	3	Muck	0.7	2.3	3	0	0
56	8/23/2006	3042931.0	2324286.0	1	Muck	0.6	2.0	4	0	0
57	8/23/2006	3042931.0	2324846.0	2	Sand	0.1	0.3	1	0	0
58	8/23/2006	3042931.0	2325126.0	5	Muck	1.0	3.3	3	0	0
59	8/23/2006	3042931.0	2325406.0	1	Muck	4.3	14.1	1	0	0
60	8/23/2006	3042931.0	2325686.0	0	Muck	6.4	21.0	0	0	0
61	8/23/2006	3042931.0	2325966.0	6	Muck	1.6	5.2	4	0	0
62	8/23/2006	3042931.0	2326246.0	2	Muck	1.3	4.3	3	0	0
63	8/21/2006	3042931.0	2326526.0	2	Muck	1.3	4.3	3	0	0

ID	DATE	US STATE PLANE NAD 83 (USft) Easting	Northing	No. TAXA	SEDIMENT	DEPTH Meters	Feet	OVERALL DENSITY	BIDBEC	DENSITY
64	8/21/2006	3042931.0	2326806.0	4	Muck	1.1	3.6	3	1	1
65	8/17/2006	3043211.0	2320646.0	8	Muck	1.1	3.6	3	0	0
66	8/17/2006	3043211.0	2320926.0	3	Muck	1.2	3.9	3	0	0
67	8/17/2006	3043211.0	2321206.0	2	Muck	1.1	3.6	2	0	0
68	8/17/2006	3043211.0	2321486.0	3	Muck	1.2	3.9	2	0	0
69	8/17/2006	3043211.0	2321766.0	3	Muck	1.0	3.3	1	0	0
70	8/17/2006	3043211.0	2322046.0	2	Muck	1.2	3.9	2	0	0
71	8/17/2006	3043211.0	2322326.0	3	Muck	1.2	3.9	1	0	0
72	8/17/2006	3043211.0	2322606.0	2	Muck	1.1	3.6	2	0	0
73	8/17/2006	3043211.0	2322886.0	3	Muck	0.9	3.0	4	0	0
74	8/23/2006	3043211.0	2324006.0	2	Muck	1.0	3.3	4	0	0
75	8/23/2006	3043211.0	2324286.0	3	Sand	0.2	0.7	2	0	0
76	8/23/2006	3043211.0	2324566.0	3	Sand	0.2	0.7	1	0	0
77_DELETED	8/23/2006	3043211.0	2324846.0							
78	8/23/2006	3043211.0	2325126.0	3	Sand	0.4	1.3	1	0	0
79	8/23/2006	3043211.0	2325406.0	2	Muck	1.5	4.9	3	0	0
80	8/23/2006	3043211.0	2325686.0	0	Muck	6.6	21.7	0	0	0
81	8/23/2006	3043211.0	2325966.0	2	Muck	2.0	6.6	4	0	0
82	8/23/2006	3043211.0	2326246.0	4	Muck	2.1	6.9	3	0	0
83	8/23/2006	3043211.0	2326526.0	0	Muck	6.0	19.7	0	0	0
84	8/21/2006	3043211.0	2326806.0	0	Muck	5.8	19.0	0	0	0
85	8/21/2006	3043211.0	2327086.0	3	Muck	2.9	9.5	4	0	0
86_DELETED	8/21/2006	3043211.0	2327366.0							
87	8/17/2006	3043491.0	2320366.0	8	Muck	1.6	5.2	5	1	1
88	8/17/2006	3043491.0	2320646.0	0	Muck	4.5	14.8	0	0	0
89	8/17/2006	3043491.0	2320926.0	6	Muck	2.0	6.6	5	0	0
90	8/17/2006	3043491.0	2321206.0	3	Muck	1.8	5.9	5	0	0
91	8/17/2006	3043491.0	2321486.0	9	Muck	1.6	5.2	4	0	0
92	8/17/2006	3043491.0	2321766.0	6	Muck	1.6	5.2	4	0	0
93	8/17/2006	3043491.0	2322046.0	6	Muck	1.6	5.2	5	0	0
94	8/17/2006	3043491.0	2322326.0	6	Muck	1.5	4.9	4	1	1
95	8/17/2006	3043491.0	2322606.0	2	Muck	1.2	3.9	1	0	0
96	8/17/2006	3043491.0	2322886.0	2	Sand	0.5	1.6	1	0	0
97	8/23/2006	3043491.0	2324006.0	4	Muck	0.8	2.6	3	0	0
98	8/29/2006	3043491.0	2324286.0	2	Muck	1.2	3.9	2	0	0
99	8/29/2006	3043491.0	2324566.0	2	Muck	1.0	3.3	3	0	0
100	8/29/2006	3043491.0	2324846.0	4	Muck	1.1	3.6	4	0	0
101	8/29/2006	3043491.0	2325126.0	3	Muck	1.3	4.3	3	0	0
102	8/29/2006	3043491.0	2325406.0	5	Muck	1.9	6.2	3	0	0
103	8/29/2006	3043491.0	2325686.0	0	Muck	7.0	23.0	0	0	0
104	8/29/2006	3043491.0	2325966.0	0	Muck	7.1	23.3	0	0	0
105	8/29/2006	3043491.0	2326246.0	0	Muck	7.1	23.3	0	0	0
106	8/21/2006	3043491.0	2327646.0	3	Muck	1.6	5.2	4	0	0
107	8/17/2006	3043771.0	2320366.0	7	Muck	2.4	7.9	5	0	0
108	8/17/2006	3043771.0	2322326.0	0	Muck	7.2	23.6	0	0	0
109	8/17/2006	3043771.0	2322606.0	3	Muck	1.9	6.2	4	0	0
110	8/17/2006	3043771.0	2322886.0	4	Sand	0.9	3.0	2	1	1
111	8/31/2006	3043771.0	2324006.0	3	Muck	0.5	1.6	4	0	0
112	8/31/2006	3043771.0	2324286.0	2	Muck	1.2	3.9	1	0	0
113	8/31/2006	3043771.0	2324566.0	2	Muck	1.2	3.9	3	0	0
114	8/31/2006	3043771.0	2324846.0	3	Muck	1.3	4.3	1	0	0
115	8/29/2006	3043771.0	2325126.0	4	Muck	1.6	5.2	3	0	0
116	8/29/2006	3043771.0	2325406.0	1	Muck	5.6	18.4	1	0	0
117	8/29/2006	3043771.0	2325966.0	0	Muck	7.1	23.3	0	0	0
118	8/29/2006	3043771.0	2326246.0	1	Muck	5.0	16.4	1	0	0
119	8/21/2006	3043771.0	2326526.0	4	Muck	2.0	6.6	2	0	0
120	8/21/2006	3043771.0	2326806.0	4	Muck	1.8	5.9	4	0	0
121	8/21/2006	3043771.0	2327086.0	1	Muck	4.5	14.8	1	0	0
122	8/21/2006	3043771.0	2327366.0	0	Muck	6.4	21.0	0	0	0
123	8/21/2006	3043771.0	2327646.0	4	Muck	2.1	6.9	3	0	0
124	8/17/2006	3044051.0	2320366.0	8	Muck	1.7	5.6	5	1	1
125	8/17/2006	3044051.0	2322606.0	7	Muck	2.7	8.9	4	1	1
126	8/17/2006	3044051.0	2322886.0	7	Muck	1.6	5.2	4	1	1

ID	DATE	US STATE PLANE NAD 83 (USft) Easting	Northing	No. TAXA	SEDIMENT	DEPTH Meters	Feet	OVERALL DENSITY	BIDBEC	DENSITY
127	8/31/2006	3044051.0	2324286.0	3	Sand	0.4	1.3	1	0	0
128	8/31/2006	3044051.0	2324566.0	3	Muck	1.1	3.6	2	0	0
129	8/31/2006	3044051.0	2324846.0	3	Muck	1.4	4.6	3	0	0
130	8/31/2006	3044051.0	2325126.0	4	Muck	1.8	5.9	3	0	0
131	8/31/2006	3044051.0	2325966.0	2	Muck	3.3	10.8	4	0	0
132	8/31/2006	3044051.0	2326246.0	4	Muck	2.0	6.6	3	0	0
133	8/21/2006	3044051.0	2326526.0	2	Muck	1.7	5.6	2	0	0
134	8/21/2006	3044051.0	2326806.0	2	Muck	1.5	4.9	3	0	0
135	8/21/2006	3044051.0	2327086.0	3	Muck	1.6	5.2	3	0	0
136	8/21/2006	3044051.0	2327366.0	2	Muck	1.7	5.6	3	0	0
137	8/21/2006	3044051.0	2327646.0	4	Muck	1.5	4.9	3	0	0
138	8/21/2006	3044051.0	2327926.0	4	Muck	1.6	5.2	4	0	0
139	8/17/2006	3044331.0	2320366.0	5	Sand	0.8	2.6	1	0	0
140	8/17/2006	3044331.0	2320646.0	0	Muck	6.0	19.7	0	0	0
141	8/17/2006	3044331.0	2322886.0	3	Muck	4.8	15.7	1	1	1
142	8/17/2006	3044331.0	2323166.0	6	Muck	1.6	5.2	4	1	1
143	8/17/2006	3044331.0	2323446.0	4	Muck	1.9	6.2	3	0	0
144	8/17/2006	3044331.0	2323726.0	4	Muck	0.9	3.0	3	0	0
145	8/31/2006	3044331.0	2324566.0	2	Sand	0.6	2.0	1	0	0
146	8/31/2006	3044331.0	2324846.0	3	Muck	1.7	5.6	4	0	0
147	8/31/2006	3044331.0	2325126.0	0	Muck	5.8	19.0	0	0	0
148	8/31/2006	3044331.0	2325686.0	0	Muck	4.8	15.7	0	0	0
149	8/31/2006	3044331.0	2325966.0	4	Muck	1.9	6.2	3	0	0
150	8/31/2006	3044331.0	2326246.0	5	Muck	1.4	4.6	2	0	0
151	8/21/2006	3044331.0	2326526.0	2	Sand	0.7	2.3	1	0	0
152	8/21/2006	3044331.0	2326806.0	3	Muck	1.5	4.9	3	0	0
153	8/21/2006	3044331.0	2327086.0	2	Muck	1.4	4.6	3	0	0
154	8/21/2006	3044331.0	2327366.0	2	Muck	1.3	4.3	3	0	0
155	8/21/2006	3044331.0	2327646.0	4	Muck	1.2	3.9	2	0	0
156	8/21/2006	3044331.0	2327926.0	4	Muck	0.5	1.6	5	0	0
157	8/17/2006	3044611.0	2320646.0	7	Muck	1.8	5.9	5	0	0
158	8/17/2006	3044611.0	2320926.0	0	Muck	6.1	20.0	0	0	0
159	8/17/2006	3044611.0	2323166.0	1	Muck	4.5	14.8	2	0	0
160	8/17/2006	3044611.0	2323446.0	5	Muck	2.3	7.5	5	0	0
161	8/17/2006	3044611.0	2323726.0	3	Muck	1.4	4.6	5	0	0
162_DELETED	8/17/2006	3044611.0	2324006.0							
163	8/31/2006	3044611.0	2324566.0	1	Sand	0.4	1.3	1	0	0
164	8/31/2006	3044611.0	2324846.0	3	Muck	1.6	5.2	4	0	0
165	8/31/2006	3044611.0	2325126.0	5	Muck	2.6	8.5	2	0	0
166	8/31/2006	3044611.0	2325406.0	0	Muck	6.5	21.3	0	0	0
167	8/31/2006	3044611.0	2325686.0	4	Muck	2.6	8.5	1	0	0
168	8/31/2006	3044611.0	2325966.0	3	Muck	1.6	5.2	4	0	0
169_DELETED	8/29/2006	3044611.0	2326246.0							
170	8/21/2006	3044611.0	2326806.0	5	Muck	0.9	3.0	5	0	0
171	8/21/2006	3044611.0	2327086.0	5	Muck	1.2	3.9	3	0	0
172	8/21/2006	3044611.0	2327366.0	1	Muck	1.4	4.6	1	0	0
173	8/21/2006	3044611.0	2327646.0	1	Muck	1.1	3.6	2	0	0
174_DELETED	8/21/2006	3044891.0	2320646.0							
175	8/17/2006	3044891.0	2320926.0	4	Muck	2.9	9.5	2	0	0
176_DELETED	8/17/2006	3044891.0	2321206.0							
177	8/17/2006	3044891.0	2322606.0	6	Muck	2.8	9.2	2	0	0
178	8/17/2006	3044891.0	2322886.0	4	Muck	2.6	8.5	1	0	0
179	8/17/2006	3044891.0	2323166.0	5	Muck	2.6	8.5	5	0	0
180	8/17/2006	3044891.0	2323446.0	8	Muck	2.0	6.6	4	1	1
181	8/17/2006	3044891.0	2323726.0	6	Muck	1.5	4.9	5	1	1
182	8/17/2006	3044891.0	2324006.0	5	Sand	0.4	1.3	3	0	0
183_DELETED	8/31/2006	3044891.0	2324566.0							
184	8/31/2006	3044891.0	2324846.0	4	Muck	1.3	4.3	3	0	0
185	8/31/2006	3044891.0	2325126.0	4	Muck	1.9	6.2	4	0	0
186	8/31/2006	3044891.0	2325406.0	3	Muck	2.2	7.2	4	0	0
187	8/31/2006	3044891.0	2325686.0	5	Muck	1.7	5.6	3	0	0
188_DELETED	8/31/2006	3044891.0	2325966.0							
189	8/21/2006	3044891.0	2326526.0	3	Muck	0.4	1.3	4	0	0

		US STATE PLANE NAD 83 (USft)				DEPTH		OVERALL		
ID	DATE	Easting	Northing	No. TAXA	SEDIMENT	Meters	Feet	DENSITY	BIDBEC	DENSITY
190	8/21/2006	3044891.0	2327086.0	4	Sand	1.0	3.3	3	0	0
191	8/21/2006	3044891.0	2327366.0	6	Muck	1.4	4.6	4	0	0
192	8/18/2006	3045171.0	2320926.0	0	Sand	0.1	0.3	0	0	0
193	8/18/2006	3045171.0	2321206.0	8	Muck	1.9	6.2	4	0	0
194	8/18/2006	3045171.0	2321486.0	5	Muck	2.5	8.2	5	1	1
195	8/18/2006	3045171.0	2321766.0	2	Muck	2.8	9.2	5	0	0
196	8/18/2006	3045171.0	2322046.0	0	Muck	7.9	25.9	0	0	0
197	8/18/2006	3045171.0	2322606.0	0	Muck	5.7	18.7	0	0	0
198	8/18/2006	3045171.0	2322886.0	3	Muck	3.1	10.2	2	0	0
199	8/18/2006	3045171.0	2323166.0	5	Muck	2.1	6.9	2	0	0
200	8/18/2006	3045171.0	2323446.0	8	Muck	1.7	5.6	4	1	1
201	8/18/2006	3045171.0	2323726.0	3	Muck	1.3	4.3	3	0	0
202	8/31/2006	3045171.0	2324846.0	2	Muck	1.1	3.6	1	0	0
203	8/31/2006	3045171.0	2325126.0	6	Muck	1.5	4.9	3	0	0
204	8/31/2006	3045171.0	2325406.0	2	Muck	1.6	5.2	2	0	0
205	8/31/2006	3045171.0	2325686.0	3	Sand	0.5	1.6	1	0	0
206	8/21/2006	3045171.0	2326246.0	1	Sand	0.4	1.3	3	0	0
207	8/21/2006	3045171.0	2326806.0	2	Sand	0.7	2.3	1	0	0
208	8/18/2006	3045451.0	2321206.0	0	Sand	0.1	0.3	0	0	0
209	8/18/2006	3045451.0	2321486.0	9	Muck	1.7	5.6	5	1	1
210	8/18/2006	3045451.0	2321766.0	3	Muck	2.4	7.9	3	0	0
211	8/18/2006	3045451.0	2322046.0	3	Muck	3.9	12.8	3	1	1
212	8/18/2006	3045451.0	2323166.0	5	Muck	3.6	11.8	4	1	1
213	8/18/2006	3045451.0	2323446.0	5	Muck	1.3	4.3	2	0	0
214	8/18/2006	3045451.0	2323726.0	2	Muck	0.9	3.0	4	0	0
215	8/31/2006	3045451.0	2324846.0	1	Sand	0.5	1.6	1	0	0
216	8/31/2006	3045451.0	2325126.0	4	Muck	1.2	3.9	2	0	0
217	8/31/2006	3045451.0	2325406.0	4	Muck	1.3	4.3	2	0	0
218_DELETED	8/31/2006	3045451.0	2325686.0							
219	8/18/2006	3045731.0	2321766.0	5	Muck	1.2	3.9	3	1	1
220	8/18/2006	3045731.0	2322046.0	3	Muck	2.1	6.9	4	0	0
221	8/18/2006	3045731.0	2322326.0	0	Muck	6.1	20.0	0	0	0
222	8/18/2006	3045731.0	2323446.0	7	Muck	3.7	12.1	5	1	1
223_DELETED	8/18/2006	3045731.0	2324006.0							
224	8/18/2006	3045731.0	2324286.0	4	Muck	0.6	2.0	5	0	0
225	8/18/2006	3045731.0	2324566.0	5	Muck	0.5	1.6	3	0	0
226	8/31/2006	3045731.0	2325126.0	3	Muck	0.9	3.0	1	0	0
227	8/31/2006	3045731.0	2325406.0	5	Muck	1.0	3.3	3	0	0
228	8/31/2006	3045731.0	2325686.0	4	Muck	0.6	2.0	3	0	0
229	8/18/2006	3046011.0	2322326.0	7	Muck	1.4	4.6	4	0	0
230	8/18/2006	3046011.0	2322606.0	4	Muck	2.6	8.5	5	0	0
231	8/18/2006	3046011.0	2323726.0	0	Muck	5.1	16.7	0	0	0
232	8/18/2006	3046011.0	2324006.0	0	Muck	5.8	19.0	0	0	0
233	8/18/2006	3046011.0	2324286.0	0	Muck	6.0	19.7	0	0	0
234	8/18/2006	3046011.0	2324566.0	1	Muck	5.1	16.7	2	0	0
235	8/18/2006	3046011.0	2324846.0	3	Muck	1.1	3.6	5	0	0
236	8/31/2006	3046011.0	2325126.0	1	Muck	1.1	3.6	1	0	0
237	8/31/2006	3046011.0	2325406.0	0	Sand	0.6	2.0	0	0	0
238	8/31/2006	3046011.0	2325686.0	4	Sand	0.4	1.3	3	0	0
239	8/18/2006	3046291.0	2322886.0	1	Sand	0.3	1.0	1	0	0
240	8/18/2006	3046291.0	2323166.0	3	Muck	3.1	10.2	1	1	1
241	8/18/2006	3046291.0	2323446.0	0	Muck	6.3	20.7	0	0	0
242	8/18/2006	3046291.0	2323726.0	1	Muck	5.0	16.4	1	0	0
243	8/18/2006	3046291.0	2324006.0	2	Muck	3.5	11.5	5	0	0
244	8/18/2006	3046291.0	2324286.0	4	Muck	3.0	9.8	5	0	0
245	8/31/2006	3046291.0	2325126.0	2	Muck	1.3	4.3	2	0	0
246	8/31/2006	3046291.0	2325406.0	4	Muck	0.9	3.0	2	0	0
247	8/18/2006	3046571.0	2323446.0	4	Sand	0.7	2.3	1	0	0
248	8/18/2006	3046571.0	2323726.0	3	Muck	2.8	9.2	5	0	0
249	8/18/2006	3046571.0	2324006.0	3	Muck	2.6	8.5	2	0	0
250	8/18/2006	3046571.0	2324286.0	4	Muck	1.9	6.2	2	0	0
251	8/18/2006	3046571.0	2324566.0	6	Muck	1.6	5.2	4	0	0
252	8/18/2006	3046571.0	2324846.0	4	Muck	1.2	3.9	3	0	0

		US STATE PLANE NAD 83 (USft)				DEPTH				
ID	DATE	Easting	Northing	No. TAXA	SEDIMENT	Meters	Feet	OVERALL DENSITY	BIDBEC	DENSITY
253	8/31/2006	3046571.0	2325126.0	4	Muck	1.1	3.6	2	0	0
254	8/18/2006	3046851.0	2323726.0	1	Sand	0.3	1.0	1	0	0
255	8/18/2006	3046851.0	2324006.0	5	Muck	1.4	4.6	2	0	0
256	8/18/2006	3046851.0	2324286.0	1	Sand	0.4	1.3	1	0	0

19 points deleted

DELETED	No explanation in field notes
DELETED	Not sampled because point was on shore
DELETED	Not sampled because depth was over 30 feet
DELETED	Not sampled because point was under a docked boat

Contour (ft)	Samples
0 to 5	138
5 to 10	59
10 to 15	11
15 to 20	18
20 to 25	11

ID	VOUCHER	CERDEM	DENSITY	VOUCHER	CHACON	DENSITY	VOUCHER	CHAFOL	DENSITY	VOUCHER	CHAGLO	DENSITY
1_DELETED												
2_DELETED												
3_DELETED												
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	1	1	0	0	0	0	0	0	0	0	0
6_DELETED												
7_DELETED												
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	1	1	0	0	0
12_DELETED												
13_DELETED												
14	0	0	0	0	0	0	0	0	0	0	0	0
15_DELETED												
16	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0
27	0	1	1	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
31_DELETED												
32	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0
38	0	1	1	0	0	0	0	0	0	0	0	0
39	0	1	1	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0
41	0	0	0	0	0	0	0	0	0	0	0	0
42	0	1	2	0	0	0	0	0	0	0	0	0
43	0	0	0	0	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0
46	0	0	0	0	0	0	0	0	0	0	0	0
47	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0
49	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0
51	0	0	0	0	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0	0	0	0
54	0	0	0	0	0	0	0	0	0	0	0	0
55	0	0	0	0	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0	0	0	0
57	0	0	0	0	0	0	0	0	0	0	0	0
58	0	0	0	0	0	0	0	0	0	0	0	0
59	0	1	1	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0
61	0	1	1	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0	0	0	0
63	0	0	0	0	0	0	0	0	0	0	0	0
64	0	0	0	0	0	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	0	0	0	0	0
66	0	0	0	0	0	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0
71	0	0	0	0	0	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0	0	0	0	0	0
73	0	0	0	0	0	0	0	0	0	0	0	0

ID	VOUCHER	CERDEM	DENSITY	VOUCHER	CHACON	DENSITY	VOUCHER	CHAFOL	DENSITY	VOUCHER	CHAGLO	DENSITY
74	0	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0	0
76	0	0	0	0	0	0	0	0	0	0	0	0
77_DELETED												
78	0	0	0	0	1	1	0	0	0	0	0	0
79	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0
81	0	0	0	0	0	0	0	0	0	0	0	0
82	0	1	1	0	0	0	0	0	0	0	0	0
83	0	0	0	0	0	0	0	0	0	0	0	0
84	0	0	0	0	0	0	0	0	0	0	0	0
85	0	1	1	0	0	0	0	0	0	0	0	0
86_DELETED												
87	0	1	1	0	0	0	0	0	0	0	0	0
88	0	0	0	0	0	0	0	0	0	0	0	0
89	0	1	1	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0
91	0	1	1	0	0	0	0	0	0	0	0	0
92	0	1	1	0	0	0	0	0	0	0	0	0
93	0	1	1	0	0	0	0	0	0	0	0	0
94	0	0	0	0	0	0	0	0	0	0	0	0
95	0	0	0	0	0	0	0	0	0	0	0	0
96	0	0	0	0	0	0	0	0	0	0	0	0
97	0	1	1	0	0	0	0	0	0	0	0	0
98	0	0	0	0	0	0	0	0	0	0	0	0
99	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0
101	0	0	0	0	0	0	0	0	0	0	0	0
102	0	0	0	0	0	0	0	0	0	0	0	0
103	0	0	0	0	0	0	0	0	0	0	0	0
104	0	0	0	0	0	0	0	0	0	0	0	0
105	0	0	0	0	0	0	0	0	0	0	0	0
106	0	1	3	0	0	0	0	0	0	0	0	0
107	0	1	2	0	0	0	0	0	0	0	0	0
108	0	0	0	0	0	0	0	0	0	0	0	0
109	0	0	0	0	0	0	0	0	0	0	0	0
110	0	0	0	0	0	0	0	0	0	0	0	0
111	0	0	0	0	0	0	0	0	0	0	0	0
112	0	0	0	0	0	0	0	0	0	0	0	0
113	0	0	0	0	0	0	0	0	0	0	0	0
114	0	0	0	0	0	0	0	0	0	0	0	0
115	0	0	0	0	0	0	0	0	0	0	0	0
116	0	1	1	0	0	0	0	0	0	0	0	0
117	0	0	0	0	0	0	0	0	0	0	0	0
118	0	1	1	0	0	0	0	0	0	0	0	0
119	0	0	0	0	0	0	0	0	0	0	0	0
120	0	1	1	0	0	0	0	0	0	0	0	0
121	0	1	1	0	0	0	0	0	0	0	0	0
122	0	0	0	0	0	0	0	0	0	0	0	0
123	0	1	1	0	0	0	0	0	0	0	0	0
124	0	1	1	0	0	0	0	0	0	0	0	0
125	0	1	1	0	0	0	0	0	0	0	0	0
126	0	0	0	0	0	0	0	0	0	0	0	0
127	0	0	0	0	0	0	0	0	0	0	0	0
128	0	0	0	0	0	0	0	0	0	0	1	1
129	0	0	0	0	0	0	0	0	0	0	0	0
130	0	1	1	0	0	0	0	0	0	0	0	0
131	0	1	3	0	0	0	0	0	0	0	0	0
132	0	0	0	0	0	0	0	0	0	0	0	0
133	0	0	0	0	0	0	0	0	0	0	0	0
134	0	0	0	0	0	0	0	0	0	0	0	0
135	0	0	0	0	0	0	0	0	0	0	0	0
136	0	0	0	0	0	0	0	0	0	0	0	0
137	0	0	0	0	0	0	0	0	0	0	0	0
138	0	1	1	0	0	0	0	0	0	0	0	0
139	0	0	0	0	0	0	0	0	0	0	0	0
140	0	0	0	0	0	0	0	0	0	0	0	0
141	0	0	0	0	0	0	0	0	0	0	0	0
142	0	0	0	0	0	0	0	0	0	0	0	0
143	0	0	0	0	0	0	0	0	0	0	0	0
144	0	0	0	0	0	0	0	0	0	0	0	0
145	0	0	0	0	1	1	0	0	0	0	0	0
146	0	0	0	0	0	0	0	0	0	0	0	0

ID	VOUCHER	CERDEM	DENSITY	VOUCHER	CHACON	DENSITY	VOUCHER	CHAFOL	DENSITY	VOUCHER	CHAGLO	DENSITY
147	0	0	0	0	0	0	0	0	0	0	0	0
148	0	0	0	0	0	0	0	0	0	0	0	0
149	0	0	0	0	0	0	0	0	0	0	0	0
150	0	0	0	0	0	0	0	0	0	0	0	0
151	0	0	0	0	1	1	0	0	0	0	0	0
152	0	0	0	0	0	0	0	0	0	0	0	0
153	0	0	0	0	0	0	0	0	0	0	0	0
154	0	0	0	0	0	0	0	0	0	0	0	0
155	0	1	1	0	0	0	0	0	0	0	0	0
156	0	1	2	0	0	0	0	0	0	0	0	0
157	0	1	1	0	0	0	0	0	0	0	0	0
158	0	0	0	0	0	0	0	0	0	0	0	0
159	0	1	2	0	0	0	0	0	0	0	0	0
160	0	1	1	0	0	0	0	0	0	0	0	0
161	0	0	0	0	0	0	0	0	0	0	0	0
162_DELETED												
163	0	0	0	0	0	0	0	0	0	0	0	0
164	0	1	1	0	0	0	0	0	0	0	0	0
165	0	1	1	0	0	0	0	0	0	0	0	0
166	0	0	0	0	0	0	0	0	0	0	0	0
167	0	1	1	0	0	0	0	0	0	0	0	0
168	0	0	0	0	0	0	0	0	0	0	0	0
169_DELETED												
170	0	1	1	0	0	0	0	0	0	0	0	0
171	0	0	0	0	0	0	0	0	0	0	0	0
172	0	0	0	0	0	0	0	0	0	0	0	0
173	0	0	0	0	0	0	0	0	0	0	0	0
174_DELETED												
175	0	1	1	0	0	0	0	0	0	0	0	0
176_DELETED												
177	0	1	1	0	0	0	0	0	0	0	0	0
178	0	0	0	0	0	0	0	0	0	0	0	0
179	0	0	0	0	0	0	0	0	0	0	0	0
180	0	0	0	0	0	0	0	0	0	0	0	0
181	0	0	0	0	0	0	0	0	0	0	0	0
182	0	0	0	0	0	0	0	0	0	0	0	0
183_DELETED												
184	0	1	1	0	0	0	0	0	0	0	0	0
185	0	0	0	0	0	0	0	0	0	0	0	0
186	0	0	0	0	0	0	0	0	0	0	0	0
187	0	0	0	0	0	0	0	0	0	0	0	0
188_DELETED												
189	0	0	0	0	0	0	0	0	0	0	0	0
190	0	0	0	0	0	0	0	0	0	0	0	0
191	0	1	1	0	0	0	0	0	0	0	0	0
192	0	0	0	0	0	0	0	0	0	0	0	0
193	0	1	2	0	0	0	0	0	0	0	0	0
194	0	1	1	0	0	0	0	0	0	0	0	0
195	0	1	4	0	0	0	0	0	0	0	0	0
196	0	0	0	0	0	0	0	0	0	0	0	0
197	0	0	0	0	0	0	0	0	0	0	0	0
198	0	1	1	0	0	0	0	0	0	0	0	0
199	0	0	0	0	0	0	0	0	0	0	0	0
200	0	0	0	0	0	0	0	0	0	0	0	0
201	0	0	0	0	0	0	0	0	0	0	0	0
202	0	0	0	0	0	0	0	0	0	0	0	0
203	0	1	1	0	0	0	0	0	0	0	0	0
204	0	0	0	0	0	0	0	0	0	0	0	0
205	0	0	0	0	1	1	0	0	0	0	0	0
206	0	0	0	0	0	0	0	0	0	0	0	0
207	0	0	0	0	0	0	0	0	0	0	0	0
208	0	0	0	0	0	0	0	0	0	0	0	0
209	0	1	1	0	0	0	0	0	0	0	0	0
210	0	0	0	0	0	0	0	0	0	0	0	0
211	0	1	1	0	0	0	0	0	0	0	0	0
212	0	1	1	0	0	0	0	0	0	0	0	0
213	0	0	0	0	0	0	0	0	0	0	0	0
214	0	0	0	0	0	0	0	0	0	0	0	0
215	0	0	0	0	0	0	0	0	0	0	0	0
216	0	0	0	0	0	0	0	0	0	0	0	0
217	0	0	0	0	0	0	0	0	0	0	0	0
218_DELETED												
219	0	0	0	0	0	0	0	0	0	0	0	0

ID	VOUCHER	CERDEM	DENSITY	VOUCHER	CHACON	DENSITY	VOUCHER	CHAFOL	DENSITY	VOUCHER	CHAGLO	DENSITY
220	0	0	0	0	0	0	0	0	0	0	0	0
221	0	0	0	0	0	0	0	0	0	0	0	0
222	0	1	3	0	0	0	0	0	0	0	0	0
223_DELETED												
224	0	0	0	0	0	0	0	0	0	0	0	0
225	0	0	0	0	0	0	0	0	0	0	0	0
226	0	0	0	0	0	0	0	0	0	0	0	0
227	0	0	0	0	0	0	0	0	0	0	0	0
228	0	1	1	0	0	0	0	0	0	0	0	0
229	0	1	1	0	0	0	0	0	0	0	0	0
230	0	0	0	0	0	0	0	0	0	0	0	0
231	0	0	0	0	0	0	0	0	0	0	0	0
232	0	0	0	0	0	0	0	0	0	0	0	0
233	0	0	0	0	0	0	0	0	0	0	0	0
234	0	1	2	0	0	0	0	0	0	0	0	0
235	0	1	1	0	0	0	0	0	0	0	0	0
236	0	0	0	0	0	0	0	0	0	0	0	0
237	0	0	0	0	0	0	0	0	0	0	0	0
238	0	1	1	0	0	0	0	0	0	0	0	0
239	0	0	0	0	0	0	0	0	0	0	0	0
240	0	1	1	0	0	0	0	0	0	0	0	0
241	0	0	0	0	0	0	0	0	0	0	0	0
242	0	1	1	0	0	0	0	0	0	0	0	0
243	0	1	4	0	0	0	0	0	0	0	0	0
244	0	1	4	0	0	0	0	0	0	0	0	0
245	0	0	0	0	0	0	0	0	0	0	0	0
246	0	1	1	0	0	0	0	0	0	0	0	0
247	0	0	0	0	1	1	0	0	0	0	0	0
248	0	0	0	0	0	0	0	0	0	0	0	0
249	0	0	0	0	0	0	0	0	0	0	0	0
250	0	0	0	0	0	0	0	0	0	0	0	0
251	0	0	0	0	0	0	0	0	0	0	0	0
252	0	1	1	0	0	0	0	0	0	0	0	0
253	0	0	0	0	0	0	0	0	0	0	0	0
254	0	0	0	0	0	0	0	0	0	0	0	0
255	0	0	0	0	0	0	0	0	0	0	0	0
256	0	0	0	0	0	0	0	0	0	0	0	0

ID	VOUCHER	ELOCAN	DENSITY	VOUCHER	HETDUB	DENSITY	VOUCHER	MYRHET	DENSITY	VOUCHER	MYRSPI	DENSITY
1_DELETED												
2_DELETED												
3_DELETED												
4	0	1	4	0	1	1	0	0	0	0	0	0
5	0	1	2	0	1	1	0	1	1	0	0	0
6_DELETED												
7_DELETED												
8	0	1	1	0	0	0	0	1	1	0	0	0
9	0	1	4	0	1	1	0	0	0	0	0	0
10	0	1	5	0	0	0	0	0	0	0	0	0
11	0	1	5	0	0	0	0	0	0	0	0	0
12_DELETED												
13_DELETED												
14	0	0	0	0	0	0	0	0	0	0	0	0
15_DELETED												
16	0	1	2	0	1	1	0	0	0	0	0	0
17	0	1	1	0	0	0	0	0	0	0	0	0
18	0	1	1	0	0	0	0	0	0	0	0	0
19	0	1	3	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	0	1	2	0	1	3	0	0	0	0	0	0
22	0	1	1	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
26	0	1	1	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0
29	0	1	1	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
31_DELETED												
32	0	1	1	0	0	0	0	0	0	0	0	0
33	0	1	1	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0
36	0	1	1	0	0	0	0	0	0	0	0	0
37	0	1	2	0	1	1	0	0	0	0	0	0
38	0	0	0	0	1	1	0	1	1	0	0	0
39	0	1	1	0	1	1	0	0	0	0	0	0
40	0	1	1	0	1	1	0	0	0	0	0	0
41	0	0	0	0	0	0	0	0	0	0	0	0
42	0	0	0	0	0	0	0	0	0	0	0	0
43	0	1	1	0	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0	0	0	0	0
45	0	1	1	0	1	1	0	0	0	0	0	0
46	0	1	1	0	1	1	0	0	0	0	0	0
47	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0
49	0	0	0	0	0	0	0	0	0	0	0	0
50	0	1	1	0	0	0	0	0	0	0	0	0
51	0	0	0	0	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0	0	0	0
54	0	1	3	0	1	1	0	0	0	0	0	0
55	0	1	1	0	0	0	0	0	0	0	0	0
56	0	1	4	0	0	0	0	0	0	0	0	0
57	0	0	0	0	0	0	0	0	0	0	0	0
58	0	1	1	0	1	0	0	0	0	0	0	0
59	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0
61	0	1	1	0	0	0	0	0	0	0	1	1
62	0	0	0	0	0	0	0	0	0	0	0	0
63	0	0	0	0	0	0	0	0	0	0	0	0
64	0	1	1	0	0	0	0	0	0	0	0	0
65	0	1	1	0	0	0	0	0	0	0	0	0
66	0	0	0	0	0	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0	0	0	0	0
69	0	1	1	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0
71	0	0	0	0	0	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0	0	0	0	0	0
73	0	1	1	0	0	0	0	0	0	0	0	0

ID	VOUCHER	ELOCAN	DENSITY	VOUCHER	HETDUB	DENSITY	VOUCHER	MYRHET	DENSITY	VOUCHER	MYRSPI	DENSITY
74	0	0	0	0	0	0	0	0	0	0	0	0
75	0	1	1	0	0	0	0	0	0	0	0	0
76	0	0	0	0	0	0	0	0	0	0	0	0
77_DELETED												
78	0	0	0	0	0	0	0	0	0	0	0	0
79	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0
81	0	0	0	0	0	0	0	0	0	0	0	0
82	0	0	0	0	0	0	0	0	0	0	0	0
83	0	0	0	0	0	0	0	0	0	0	0	0
84	0	0	0	0	0	0	0	0	0	0	0	0
85	0	0	0	0	0	0	0	0	0	0	1	3
86_DELETED												
87	0	0	0	0	1	1	0	0	0	0	0	0
88	0	0	0	0	0	0	0	0	0	0	0	0
89	0	1	1	0	1	2	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0
91	0	1	1	0	1	1	0	0	0	0	0	0
92	0	1	1	0	0	0	0	0	0	0	0	0
93	0	0	0	0	1	1	0	0	0	0	0	0
94	0	0	0	0	0	0	0	0	0	0	0	0
95	0	0	0	0	0	0	0	0	0	0	0	0
96	0	0	0	0	0	0	0	0	0	0	0	0
97	0	1	1	0	0	0	0	0	0	0	0	0
98	0	0	0	0	0	0	0	0	0	0	1	1
99	0	0	0	0	0	0	0	0	0	0	0	0
100	0	1	1	0	1	1	0	0	0	0	0	0
101	0	1	1	0	0	0	0	0	0	0	0	0
102	0	0	0	0	0	0	0	0	0	0	1	1
103	0	0	0	0	0	0	0	0	0	0	0	0
104	0	0	0	0	0	0	0	0	0	0	0	0
105	0	0	0	0	0	0	0	0	0	0	0	0
106	0	0	0	0	0	0	0	0	0	0	0	0
107	0	1	1	0	0	0	0	0	0	0	0	0
108	0	0	0	0	0	0	0	0	0	0	0	0
109	0	0	0	0	0	0	0	0	0	0	0	0
110	0	0	0	0	0	0	0	0	0	0	0	0
111	0	1	1	0	0	0	0	0	0	0	0	0
112	0	0	0	0	0	0	0	0	0	0	0	0
113	0	0	0	0	0	0	0	0	0	0	0	0
114	0	1	1	0	0	0	0	0	0	0	0	0
115	0	1	1	0	0	0	0	0	0	0	0	0
116	0	0	0	0	0	0	0	0	0	0	0	0
117	0	0	0	0	0	0	0	0	0	0	0	0
118	0	0	0	0	0	0	0	0	0	0	0	0
119	0	1	1	0	0	0	0	0	0	0	0	0
120	0	0	0	0	0	0	0	0	0	0	1	1
121	0	0	0	0	0	0	0	0	0	0	0	0
122	0	0	0	0	0	0	0	0	0	0	0	0
123	0	0	0	0	0	0	0	0	0	0	0	0
124	0	1	1	0	0	0	0	0	0	0	0	0
125	0	1	1	0	1	1	0	0	0	0	0	0
126	0	1	1	0	1	1	0	0	0	0	0	0
127	0	0	0	0	0	0	0	0	0	0	0	0
128	0	0	0	0	0	0	0	0	0	0	0	0
129	0	1	1	0	0	0	0	0	0	0	0	0
130	0	1	1	0	0	0	0	0	0	0	0	0
131	0	0	0	0	0	0	0	0	0	0	0	0
132	0	1	1	0	0	0	0	0	0	0	0	0
133	0	0	0	0	0	0	0	0	0	0	0	0
134	0	0	0	0	0	0	0	0	0	0	0	0
135	0	0	0	0	0	0	0	0	0	0	0	0
136	0	0	0	0	0	0	0	0	0	0	0	0
137	0	1	1	0	0	0	0	0	0	0	1	1
138	0	1	2	0	0	0	0	0	0	0	0	0
139	0	1	1	0	1	1	0	0	0	0	0	0
140	0	0	0	0	0	0	0	0	0	0	0	0
141	0	0	0	0	0	0	0	0	0	0	0	0
142	0	0	0	0	0	0	0	0	0	0	0	0
143	0	0	0	0	0	0	0	0	0	0	0	0
144	0	1	1	0	0	0	0	0	0	0	0	0
145	0	0	0	0	0	0	0	0	0	0	0	0
146	0	0	0	0	1	1	0	0	0	0	0	0

ID	VOUCHER	ELOCAN	DENSITY	VOUCHER	HETDUB	DENSITY	VOUCHER	MYRHET	DENSITY	VOUCHER	MYRSPI	DENSITY
147	0	0	0	0	0	0	0	0	0	0	0	0
148	0	0	0	0	0	0	0	0	0	0	0	0
149	0	1	1	0	0	0	0	0	0	0	1	1
150	0	1	1	0	1	1	0	0	0	0	0	0
151	0	0	0	0	0	0	0	0	0	0	0	0
152	0	0	0	0	0	0	0	0	0	0	0	0
153	0	0	0	0	0	0	0	0	0	0	0	0
154	0	1	1	0	0	0	0	0	0	0	0	0
155	0	0	0	0	0	0	0	0	0	0	0	0
156	0	1	2	0	1	1	0	0	0	0	0	0
157	0	1	1	0	0	0	0	0	0	0	0	0
158	0	0	0	0	0	0	0	0	0	0	0	0
159	0	0	0	0	0	0	0	0	0	0	0	0
160	0	0	0	0	0	0	0	0	0	0	0	0
161	0	0	0	0	0	0	0	0	0	0	0	0
162_DELETED												
163	0	0	0	0	0	0	0	0	0	0	0	0
164	0	0	0	0	0	0	0	0	0	0	0	0
165	0	1	1	0	1	1	0	0	0	0	0	0
166	0	0	0	0	0	0	0	0	0	0	0	0
167	0	0	0	0	0	0	0	0	0	0	0	0
168	0	1	1	0	0	0	0	0	0	0	0	0
169_DELETED												
170	0	1	3	0	0	0	0	0	0	0	0	0
171	0	1	1	0	0	0	0	0	0	0	0	0
172	0	0	0	0	0	0	0	0	0	0	0	0
173	0	0	0	0	0	0	0	0	0	0	0	0
174_DELETED												
175	0	0	0	0	0	0	0	0	0	0	0	0
176_DELETED												
177	0	1	1	0	0	0	0	0	0	0	1	1
178	0	0	0	0	0	0	0	0	0	0	0	0
179	0	0	0	0	0	0	0	0	0	0	0	0
180	0	1	1	0	0	0	0	0	0	0	0	0
181	0	0	0	0	0	0	0	0	0	0	0	0
182	0	1	1	0	0	0	0	0	0	0	1	1
183_DELETED												
184	0	0	0	0	0	0	0	0	0	0	0	0
185	0	0	0	0	1	1	0	0	0	0	0	0
186	0	0	0	0	0	0	0	0	0	0	0	0
187	0	0	0	0	0	0	0	0	0	0	1	1
188_DELETED												
189	0	1	3	0	1	1	0	0	0	0	0	0
190	0	1	1	0	0	0	0	0	0	0	0	0
191	0	1	1	0	0	0	0	0	0	0	1	1
192	0	0	0	0	0	0	0	0	0	0	0	0
193	0	1	1	0	0	0	0	0	0	0	1	1
194	0	1	1	0	0	0	0	0	0	0	0	0
195	0	0	0	0	0	0	0	0	0	0	0	0
196	0	0	0	0	0	0	0	0	0	0	0	0
197	0	0	0	0	0	0	0	0	0	0	0	0
198	0	0	0	0	0	0	0	0	0	0	0	0
199	0	0	0	0	0	0	0	0	0	0	0	0
200	0	1	1	0	1	1	0	1	1	0	0	0
201	0	0	0	0	0	0	0	0	0	0	0	0
202	0	0	0	0	0	0	0	0	0	0	0	0
203	0	0	0	0	0	0	0	0	0	0	0	0
204	0	0	0	0	0	0	0	0	0	0	0	0
205	0	0	0	0	0	0	0	0	0	0	0	0
206	0	1	3	0	0	0	0	0	0	0	0	0
207	0	1	1	0	0	0	0	0	0	0	0	0
208	0	0	0	0	0	0	0	0	0	0	0	0
209	0	1	1	0	0	0	0	0	0	0	1	1
210	0	0	0	0	0	0	0	0	0	0	0	0
211	0	0	0	0	0	0	0	0	0	0	0	0
212	0	0	0	0	0	0	0	1	1	0	0	0
213	0	1	1	0	0	0	0	0	0	0	0	0
214	0	0	0	0	0	0	0	0	0	0	0	0
215	0	0	0	0	0	0	0	0	0	0	0	0
216	0	0	0	0	0	0	0	0	0	0	0	0
217	0	1	1	0	0	0	0	0	0	0	0	0
218_DELETED												
219	0	0	0	0	0	0	0	0	0	0	0	0

ID	VOUCHER	ELOCAN	DENSITY	VOUCHER	HETDUB	DENSITY	VOUCHER	MYRHET	DENSITY	VOUCHER	MYRSPI	DENSITY
220	0	0	0	0	0	0	0	0	0	0	0	0
221	0	0	0	0	0	0	0	0	0	0	0	0
222	0	1	1	0	1	1	0	0	0	0	0	0
223_DELETED												
224	0	1	1	0	0	0	0	0	0	0	0	0
225	0	1	1	0	0	0	0	0	0	0	0	0
226	0	0	0	0	0	0	0	0	0	0	0	0
227	0	1	1	0	1	1	0	0	0	0	0	0
228	0	1	1	0	1	1	0	0	0	0	0	0
229	0	1	1	0	0	0	0	0	0	0	0	0
230	0	1	1	0	0	0	0	0	0	0	0	0
231	0	0	0	0	0	0	0	0	0	0	0	0
232	0	0	0	0	0	0	0	0	0	0	0	0
233	0	0	0	0	0	0	0	0	0	0	0	0
234	0	0	0	0	0	0	0	0	0	0	0	0
235	0	0	0	0	0	0	0	0	0	0	0	0
236	0	0	0	0	0	0	0	0	0	0	0	0
237	0	0	0	0	0	0	0	0	0	0	0	0
238	0	1	1	0	0	0	0	0	0	0	0	0
239	0	0	0	0	0	0	0	0	0	0	0	0
240	0	0	0	0	0	0	0	0	0	0	0	0
241	0	0	0	0	0	0	0	0	0	0	0	0
242	0	0	0	0	0	0	0	0	0	0	0	0
243	0	0	0	0	0	0	0	0	0	0	0	0
244	0	0	0	0	0	0	0	0	0	0	0	0
245	0	0	0	0	0	0	0	0	0	0	0	0
246	0	1	1	0	0	0	0	0	0	0	0	0
247	0	0	0	0	0	0	0	0	0	0	0	0
248	0	0	0	0	0	0	0	0	0	0	0	0
249	0	0	0	0	0	0	0	0	0	0	0	0
250	0	0	0	0	0	0	0	0	0	0	0	0
251	0	1	1	0	1	1	0	0	0	0	0	0
252	0	0	0	0	0	0	0	0	0	0	0	0
253	0	1	1	0	0	0	0	0	0	0	0	0
254	0	0	0	0	0	0	0	0	0	0	0	0
255	0	1	1	0	0	0	0	0	0	0	1	1
256	0	0	0	0	0	0	0	0	0	0	0	0

ID	VOUCHER	MYR?	DENSITY	VOUCHER	NAJFLE	DENSITY	VOUCHER	NUPADV	DENSITY	VOUCHER	NYMODT	DENSITY
1_DELETED												
2_DELETED												
3_DELETED												
4	0	0	0	0	1	1	0	0	0	0	0	0
5	0	0	0	0	1	1	0	0	0	0	0	0
6_DELETED												
7_DELETED												
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	1	1	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	1	1	0	0	0	0	0	0
12_DELETED												
13_DELETED												
14	0	1	1	0	0	0	0	0	0	0	1	1
15_DELETED												
16	0	0	0	0	1	2	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
19	0	1	1	0	1	1	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	1	1	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	1	1	0	0	0	0	0	0
31_DELETED												
32	0	0	0	0	1	3	0	0	0	0	0	0
33	0	0	0	0	1	1	0	0		0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0
37	0	1	1	0	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	1	1	1	1	1
39	0	0	0	0	1	1	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0
41	0	0	0	0	0	0	0	0	0	0	0	0
42	0	0	0	0	0	0	0	0	0	0	0	0
43	0	0	0	0	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	1	1	0	0	0	0	0	0
46	0	0	0	0	1	1	0	0	0	0	0	0
47	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	1	1	0	0	0	0	0	0
49	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0
51	0	0	0	0	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0	0	0	0
54	0	0	0	0	0	0	0	0	0	0	0	0
55	0	1	1	0	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0	0	0	0
57	0	0	0	0	1	1	0	0	0	0	0	0
58	0	0	0	0	1	1	0	0	0	0	0	0
59	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0	0	0	0
63	0	0	0	0	0	0	0	0	0	0	0	0
64	0	0	0	0	0	0	0	0	0	0	0	0
65	0	0	0	0	1	1	0	0	0	0	0	0
66	0	0	0	0	0	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0
71	0	0	0	0	0	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0	0	0	0	0	0
73	0	0	0	0	1	1	0	0	0	0	0	0

ID	VOUCHER	MYR?	DENSITY	VOUCHER	NAJFLE	DENSITY	VOUCHER	NUPADV	DENSITY	VOUCHER	NYMODT	DENSITY
74	0	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	1	2	0	0	0	0	0	0
76	0	0	0	0	1	1	0	0	0	0	0	0
77_DELETED												
78	0	0	0	0	1	1	0	0	0	0	0	0
79	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0
81	0	0	0	0	0	0	0	0	0	0	0	0
82	0	1	1	0	0	0	0	0	0	0	0	0
83	0	0	0	0	0	0	0	0	0	0	0	0
84	0	0	0	0	0	0	0	0	0	0	0	0
85	0	0	0	0	0	0	0	0	0	0	0	0
86_DELETED												
87	0	0	0	0	1	1	0	0	0	0	0	0
88	0	0	0	0	0	0	0	0	0	0	0	0
89	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0
91	0	1	1	0	0	0	0	0	0	0	0	0
92	0	0	0	0	0	0	0	0	0	0	0	0
93	0	0	0	0	0	0	0	0	0	0	0	0
94	0	0	0	0	0	0	0	0	0	0	0	0
95	0	0	0	0	0	0	0	0	0	0	0	0
96	0	0	0	0	0	0	0	0	0	0	0	0
97	0	0	0	0	1	1	0	0	0	0	0	0
98	0	0	0	0	0	0	0	0	0	0	0	0
99	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0
101	0	0	0	0	0	0	0	0	0	0	0	0
102	0	0	0	0	1	1	0	0	0	0	0	0
103	0	0	0	0	0	0	0	0	0	0	0	0
104	0	0	0	0	0	0	0	0	0	0	0	0
105	0	0	0	0	0	0	0	0	0	0	0	0
106	0	0	0	0	0	0	0	0	0	0	0	0
107	0	1	1	0	0	0	0	0	0	0	0	0
108	0	0	0	0	0	0	0	0	0	0	0	0
109	0	0	0	0	0	0	0	0	0	0	0	0
110	0	0	0	0	1	1	0	0	0	0	0	0
111	0	0	0	0	1	1	0	0	0	0	0	0
112	0	0	0	0	0	0	0	0	0	0	0	0
113	0	0	0	0	0	0	0	0	0	0	0	0
114	0	0	0	0	1	1	0	0	0	0	0	0
115	0	0	0	0	0	0	0	0	0	0	0	0
116	0	0	0	0	0	0	0	0	0	0	0	0
117	0	0	0	0	0	0	0	0	0	0	0	0
118	0	0	0	0	0	0	0	0	0	0	0	0
119	0	1	1	0	0	0	0	0	0	0	0	0
120	0	0	0	0	0	0	0	0	0	0	0	0
121	0	0	0	0	0	0	0	0	0	0	0	0
122	0	0	0	0	0	0	0	0	0	0	0	0
123	0	1	1	0	1	1	0	0	0	0	0	0
124	0	1	1	0	0	0	0	0	0	0	0	0
125	0	1	1	0	0	0	0	0	0	0	0	0
126	0	0	0	0	1	1	0	0	0	0	0	0
127	0	0	0	0	1	1	0	0	0	0	0	0
128	0	0	0	0	1	1	0	0	0	0	0	0
129	0	0	0	0	0	0	0	0	0	0	0	0
130	0	0	0	0	0	0	0	0	0	0	0	0
131	0	0	0	0	0	0	0	0	0	0	0	0
132	0	0	0	0	0	0	0	0	0	0	0	0
133	0	0	0	0	0	0	0	0	0	0	0	0
134	0	0	0	0	0	0	0	0	0	0	0	0
135	0	0	0	0	0	0	0	0	0	0	0	0
136	0	0	0	0	0	0	0	0	0	0	0	0
137	0	0	0	0	0	0	0	0	0	0	0	0
138	0	1	1	0	0	0	0	0	0	0	0	0
139	0	0	0	0	1	1	0	0	0	0	0	0
140	0	0	0	0	0	0	0	0	0	0	0	0
141	0	0	0	0	0	0	0	0	0	0	0	0
142	0	0	0	0	1	1	0	0	0	0	0	0
143	0	0	0	0	1	1	0	0	0	0	0	0
144	0	0	0	0	0	0	0	0	0	0	0	0
145	0	0	0	0	0	0	0	0	0	0	0	0
146	0	0	0	0	0	0	0	0	0	0	0	0

ID	VOUCHER	MYR?	DENSITY	VOUCHER	NAJFLE	DENSITY	VOUCHER	NUPADV	DENSITY	VOUCHER	NYMODT	DENSITY
147	0	0	0	0	0	0	0	0	0	0	0	0
148	0	0	0	0	0	0	0	0	0	0	0	0
149	0	0	0	0	0	0	0	0	0	0	0	0
150	0	0	0	0	0	0	0	0	0	0	0	0
151	0	0	0	0	1	1	0	0	0	0	0	0
152	0	1	1	0	0	0	0	0	0	0	0	0
153	0	0	0	0	0	0	0	0	0	0	0	0
154	0	0	0	0	0	0	0	0	0	0	0	0
155	0	1	1	0	0	0	0	0	0	0	0	0
156	0	1	1	0	0	0	0	0	0	0	0	0
157	0	1	1	0	1	1	0	0	0	0	0	0
158	0	0	0	0	0	0	0	0	0	0	0	0
159	0	0	0	0	0	0	0	0	0	0	0	0
160	0	0	0	0	0	0	0	0	0	0	0	0
161	0	0	0	0	0	0	0	0	0	0	0	0
162_DELETED												
163	0	0	0	0	0	0	0	0	0	0	0	0
164	0	0	0	0	0	0	0	0	0	0	0	0
165	0	0	0	0	0	0	0	0	0	0	0	0
166	0	0	0	0	0	0	0	0	0	0	0	0
167	0	0	0	0	0	0	0	0	0	0	0	0
168	0	0	0	0	1	1	0	0	0	0	0	0
169_DELETED												
170	0	0	0	0	1	2	0	0	0	0	0	0
171	0	0	0	0	1	1	0	0	0	0	0	0
172	0	0	0	0	0	0	0	0	0	0	0	0
173	0	0	0	0	0	0	0	0	0	0	0	0
174_DELETED												
175	0	0	0	0	1	1	0	0	0	0	0	0
176_DELETED												
177	0	0	0	0	0	0	0	0	0	0	0	0
178	0	0	0	0	0	0	0	0	0	0	0	0
179	0	0	0	0	0	0	0	0	0	0	0	0
180	0	1	1	0	0	0	0	0	0	0	0	0
181	0	1	1	0	0	0	0	0	0	0	0	0
182	0	0	0	0	1	2	0	0	0	0	0	0
183_DELETED												
184	0	0	0	0	1	1	0	0	0	0	0	0
185	0	0	0	0	0	0	0	0	0	0	0	0
186	0	0	0	0	1	1	0	0	0	0	0	0
187	0	0	0	0	1	1	0	0	0	0	0	0
188_DELETED												
189	0	1	1	0	0	0	0	0	0	0	0	0
190	0	1	1	0	1	2	0	0	0	0	0	0
191	0	0	0	0	1	1	0	0	0	0	0	0
192	0	0	0	0	0	0	0	0	0	0	0	0
193	0	0	0	0	1	1	0	0	0	0	0	0
194	0	0	0	0	1	1	0	0	0	0	0	0
195	0	0	0	0	0	0	0	0	0	0	0	0
196	0	0	0	0	0	0	0	0	0	0	0	0
197	0	0	0	0	0	0	0	0	0	0	0	0
198	0	1	1	0	0	0	0	0	0	0	0	0
199	0	0	0	0	0	0	0	0	0	0	0	0
200	0	0	0	0	1	1	0	0	0	0	0	0
201	0	0	0	0	1	1	0	0	0	0	0	0
202	0	0	0	0	1	1	0	0	0	0	0	0
203	0	0	0	0	1	1	0	0	0	0	0	0
204	0	0	0	0	0	0	0	0	0	0	0	0
205	0	0	0	0	0	0	0	0	0	0	0	0
206	0	0	0	0	0	0	0	0	0	0	0	0
207	0	0	0	0	0	0	0	0	0	0	0	0
208	0	0	0	0	0	0	0	0	0	0	0	0
209	0	0	0	0	1	1	0	0	0	0	0	0
210	0	0	0	0	0	0	0	0	0	0	0	0
211	0	0	0	0	0	0	0	0	0	0	0	0
212	0	0	0	0	0	0	0	0	0	0	0	0
213	0	0	0	0	1	2	0	0	0	0	0	0
214	0	0	0	0	0	0	0	0	0	0	0	0
215	0	0	0	0	0	0	0	0	0	0	0	0
216	0	0	0	0	1	1	0	0	0	0	0	0
217	0	0	0	0	1	1	0	0	0	0	0	0
218_DELETED												
219	0	0	0	0	1	2	0	0	0	0	0	0

ID	VOUCHER	MYR?	DENSITY	VOUCHER	NAJFLE	DENSITY	VOUCHER	NUPADV	DENSITY	VOUCHER	NYMODT	DENSITY
220	0	0	0	0	0	0	0	0	0	0	0	0
221	0	0	0	0	0	0	0	0	0	0	0	0
222	0	0	0	0	1	1	0	0	0	0	0	0
223_DELETED												
224	0	0	0	0	1	1	0	0	0	0	0	0
225	0	0	0	0	1	1	0	0	0	0	0	0
226	0	0	0	0	1	1	0	0	0	0	0	0
227	0	0	0	0	1	1	0	0	0	0	0	0
228	0	0	0	0	0	0	0	0	0	0	0	0
229	0	1	1	0	1	1	0	0	0	0	0	0
230	0	0	0	0	1	1	0	0	0	0	0	0
231	0	0	0	0	0	0	0	0	0	0	0	0
232	0	0	0	0	0	0	0	0	0	0	0	0
233	0	0	0	0	0	0	0	0	0	0	0	0
234	0	0	0	0	0	0	0	0	0	0	0	0
235	0	0	0	0	0	0	0	0	0	0	0	0
236	0	0	0	0	0	0	0	0	0	0	0	0
237	0	0	0	0	0	0	0	0	0	0	0	0
238	0	0	0	0	1	1	0	0	0	0	0	0
239	0	0	0	0	0	0	0	0	0	0	0	0
240	0	0	0	0	1	1	0	0	0	0	0	0
241	0	0	0	0	0	0	0	0	0	0	0	0
242	0	0	0	0	0	0	0	0	0	0	0	0
243	0	0	0	0	0	0	0	0	0	0	0	0
244	0	0	0	0	0	0	0	0	0	0	0	0
245	0	0	0	0	0	0	0	0	0	0	0	0
246	0	0	0	0	1	1	0	0	0	0	0	0
247	0	0	0	0	1	1	0	0	0	0	0	0
248	0	0	0	0	0	0	0	0	0	0	0	0
249	0	0	0	0	1	1	0	0	0	0	0	0
250	0	0	0	0	0	0	0	0	0	0	0	0
251	0	0	0	0	1	1	0	0	0	0	0	0
252	0	0	0	0	0	0	0	0	0	0	0	0
253	0	0	0	0	1	1	0	0	0	0	0	0
254	0	0	0	0	0	0	0	0	0	0	0	0
255	0	0	0	0	1	0	0	0	0	0	0	0
256	0	0	0	0	0	0	0	0	0	0	0	0

ID	VOUCHER	POTGRA/ILL?	DENSITY	VOUCHER	POTAMP	DENSITY	VOUCHER	POTFRI	DENSITY	VOUCHER	POTGRA	DENSITY
1_DELETED												
2_DELETED												
3_DELETED												
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
6_DELETED												
7_DELETED												
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0
12_DELETED												
13_DELETED												
14	0	0	0	0	0	0	0	0	0	0	0	0
15_DELETED												
16	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	1	1	0	0	0	0	1	1
24	0	0	0	0	0	0	0	0	0	0	0	0
25	0	1	1	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
31_DELETED												
32	0	0	0	0	0	0	0	0	0	0	0	0
33	0	1	1	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0
36	0	1	1	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0	0	0	0	0
39	0	1	1	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0
41	0	0	0	0	0	0	0	0	0	0	0	0
42	0	0	0	0	0	0	0	0	0	0	0	0
43	0	0	0	0	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0
46	0	0	0	0	0	0	0	0	0	0	0	0
47	0	0	0	0	0	0	0	0	0	0	0	0
48	0	1	1	0	0	0	0	0	0	0	0	0
49	0	1	1	0	0	0	0	0	0	0	0	0
50	0	1	1	0	0	0	0	0	0	0	0	0
51	0	0	0	0	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0	0	0	0
54	0	0	0	0	0	0	0	0	0	0	0	0
55	0	1	1	0	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0	0	0	0
57	0	0	0	0	0	0	0	0	0	0	0	0
58	0	0	0	0	0	0	0	0	0	0	0	0
59	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0	0	0	0
63	0	0	0	0	0	0	0	0	0	0	0	0
64	0	0	0	0	0	0	0	0	0	0	0	0
65	0	1	1	0	0	0	0	0	0	0	0	0
66	0	1	1	0	0	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0
71	0	0	0	0	0	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0	0	0	0	0	0
73	0	0	0	0	0	0	0	0	0	0	0	0

ID	VOUCHER	POTGRA/ILL?	DENSITY	VOUCHER	POTAMP	DENSITY	VOUCHER	POTFRI	DENSITY	VOUCHER	POTGRA	DENSITY
74	0	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0	0
76	0	0	0	0	0	0	0	0	0	0	0	0
77_DELETED												
78	0	0	0	0	0	0	0	0	0	0	0	0
79	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0
81	0	0	0	0	0	0	0	0	0	0	0	0
82	0	0	0	0	0	0	0	0	0	0	0	0
83	0	0	0	0	0	0	0	0	0	0	0	0
84	0	0	0	0	0	0	0	0	0	0	0	0
85	0	0	0	0	0	0	0	0	0	0	0	0
86_DELETED												
87	0	1	1	0	0	0	0	0	0	0	0	0
88	0	0	0	0	0	0	0	0	0	0	0	0
89	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0
91	0	1	1	0	0	0	0	0	0	0	0	0
92	0	0	0	0	0	0	0	0	0	0	0	0
93	0	1	1	0	0	0	0	0	0	0	0	0
94	0	1	1	0	0	0	0	0	0	0	0	0
95	0	0	0	0	0	0	0	0	0	0	0	0
96	0	0	0	0	0	0	0	0	0	0	0	0
97	0	0	0	0	0	0	0	0	0	0	0	0
98	0	0	0	0	0	0	0	0	0	0	0	0
99	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0
101	0	0	0	0	0	0	0	0	0	0	0	0
102	0	0	0	0	0	0	0	0	0	0	0	0
103	0	0	0	0	0	0	0	0	0	0	0	0
104	0	0	0	0	0	0	0	0	0	0	0	0
105	0	0	0	0	0	0	0	0	0	0	0	0
106	0	0	0	0	0	0	0	0	0	0	0	0
107	0	0	0	0	0	0	0	0	0	0	0	0
108	0	0	0	0	0	0	0	0	0	0	0	0
109	0	0	0	0	0	0	0	0	0	0	0	0
110	0	0	0	0	0	0	0	0	0	0	0	0
111	0	0	0	0	0	0	0	0	0	0	0	0
112	0	0	0	0	0	0	0	0	0	0	0	0
113	0	0	0	0	0	0	0	0	0	0	0	0
114	0	0	0	0	0	0	0	0	0	0	0	0
115	0	0	0	0	0	0	0	0	0	0	0	0
116	0	0	0	0	0	0	0	0	0	0	0	0
117	0	0	0	0	0	0	0	0	0	0	0	0
118	0	0	0	0	0	0	0	0	0	0	0	0
119	0	0	0	0	0	0	0	0	0	0	0	0
120	0	0	0	0	0	0	0	0	0	0	0	0
121	0	0	0	0	0	0	0	0	0	0	0	0
122	0	0	0	0	0	0	0	0	0	0	0	0
123	0	0	0	0	0	0	0	0	0	0	0	0
124	0	0	0	0	0	0	0	0	0	0	0	0
125	0	0	0	0	0	0	0	0	0	0	0	0
126	0	1	1	0	0	0	0	0	0	0	0	0
127	0	0	0	0	0	0	0	0	0	0	0	0
128	0	0	0	0	0	0	0	0	0	0	0	0
129	0	0	0	0	0	0	0	0	0	0	0	0
130	0	0	0	0	0	0	0	0	0	0	0	0
131	0	0	0	0	0	0	0	0	0	0	0	0
132	0	0	0	0	0	0	0	0	0	0	0	0
133	0	0	0	0	0	0	0	0	0	0	0	0
134	0	0	0	0	0	0	0	0	0	0	0	0
135	0	0	0	0	0	0	0	0	0	0	0	0
136	0	0	0	0	0	0	0	0	0	0	0	0
137	0	0	0	0	0	0	0	0	0	0	0	0
138	0	0	0	0	0	0	0	0	0	0	0	0
139	0	0	0	0	0	0	0	0	0	0	0	0
140	0	0	0	0	0	0	0	0	0	0	0	0
141	0	0	0	0	0	0	0	0	0	0	0	0
142	0	0	0	0	0	0	0	0	0	0	0	0
143	0	0	0	0	0	0	0	0	0	0	0	0
144	0	0	0	0	0	0	0	0	0	0	0	0
145	0	0	0	0	0	0	0	0	0	0	0	0
146	0	0	0	0	0	0	0	0	0	0	0	0

ID	VOUCHER	POTGRA/ILL?	DENSITY	VOUCHER	POTAMP	DENSITY	VOUCHER	POTFRI	DENSITY	VOUCHER	POTGRA	DENSITY
147	0	0	0	0	0	0	0	0	0	0	0	0
148	0	0	0	0	0	0	0	0	0	0	0	0
149	0	0	0	0	0	0	0	0	0	0	0	0
150	0	0	0	0	0	0	0	0	0	0	0	0
151	0	0	0	0	0	0	0	0	0	0	0	0
152	0	0	0	0	0	0	0	0	0	0	0	0
153	0	0	0	0	0	0	0	0	0	0	0	0
154	0	0	0	0	0	0	0	0	0	0	0	0
155	0	0	0	0	0	0	0	0	0	0	0	0
156	0	0	0	0	0	0	0	0	0	0	0	0
157	0	0	0	0	0	0	0	0	0	0	0	0
158	0	0	0	0	0	0	0	0	0	0	0	0
159	0	0	0	0	0	0	0	0	0	0	0	0
160	0	0	0	0	0	0	0	0	0	0	0	0
161	0	0	0	0	0	0	0	0	0	0	0	0
162_DELETED												
163	0	0	0	0	0	0	0	0	0	0	0	0
164	0	0	0	0	0	0	0	0	0	0	0	0
165	0	0	0	0	0	0	0	0	0	0	0	0
166	0	0	0	0	0	0	0	0	0	0	0	0
167	0	0	0	0	0	0	0	0	0	0	0	0
168	0	0	0	0	0	0	0	0	0	0	0	0
169_DELETED												
170	0	0	0	0	0	0	0	0	0	0	0	0
171	0	0	0	0	0	0	0	0	0	0	0	0
172	0	0	0	0	0	0	0	0	0	0	0	0
173	0	0	0	0	0	0	0	0	0	0	0	0
174_DELETED												
175	0	0	0	0	0	0	0	0	0	0	0	0
176_DELETED												
177	0	1	1	0	0	0	0	0	0	0	0	0
178	0	1	1	0	0	0	0	0	0	0	0	0
179	0	0	0	0	0	0	0	0	0	0	0	0
180	0	0	0	0	0	0	0	0	0	0	0	0
181	0	0	0	0	1	1	0	0	0	0	0	0
182	0	1	1	0	0	0	0	0	0	0	0	0
183_DELETED												
184	0	0	0	0	0	0	0	0	0	0	0	0
185	0	1	1	0	0	0	0	0	0	0	0	0
186	0	0	0	0	0	0	0	0	0	0	0	0
187	0	0	0	0	0	0	0	0	0	0	0	0
188_DELETED												
189	0	0	0	0	0	0	0	0	0	0	0	0
190	0	0	0	0	0	0	0	0	0	0	0	0
191	0	0	0	0	0	0	0	0	0	0	0	0
192	0	0	0	0	0	0	0	0	0	0	0	0
193	0	0	0	0	0	0	0	1	1	0	0	0
194	0	0	0	0	0	0	0	0	0	0	0	0
195	0	0	0	0	0	0	0	0	0	0	0	0
196	0	0	0	0	0	0	0	0	0	0	0	0
197	0	0	0	0	0	0	0	0	0	0	0	0
198	0	0	0	0	0	0	0	0	0	0	0	0
199	0	0	0	0	0	0	0	0	0	0	0	0
200	0	0	0	0	0	0	0	0	0	0	0	0
201	0	0	0	0	0	0	0	0	0	0	0	0
202	0	0	0	0	0	0	0	0	0	0	0	0
203	0	0	0	0	0	0	0	0	0	0	0	0
204	0	0	0	0	0	0	0	0	0	0	0	0
205	0	0	0	0	0	0	0	0	0	0	0	0
206	0	0	0	0	0	0	0	0	0	0	0	0
207	0	0	0	0	0	0	0	0	0	0	0	0
208	0	0	0	0	0	0	0	0	0	0	0	0
209	0	1	2	0	0	0	0	0	0	0	0	0
210	0	0	0	0	1	1	0	0	0	0	0	0
211	0	0	0	0	0	0	0	0	0	0	0	0
212	0	0	0	0	0	0	0	0	0	0	0	0
213	0	1	1	0	0	0	0	0	0	0	0	0
214	0	0	0	0	0	0	0	0	0	0	0	0
215	0	0	0	0	0	0	0	0	0	0	0	0
216	0	0	0	0	0	0	0	0	0	0	0	0
217	0	0	0	0	0	0	0	0	0	0	0	0
218_DELETED												
219	0	1	1	0	0	0	0	0	0	0	0	0

ID	VOUCHER	POTGRA/ILL?	DENSITY	VOUCHER	POTAMP	DENSITY	VOUCHER	POTFRI	DENSITY	VOUCHER	POTGRA	DENSITY
220	0	0	0	0	0	0	0	0	0	0	0	0
221	0	0	0	0	0	0	0	0	0	0	0	0
222	0	0	0	0	0	0	0	0	0	0	0	0
223_DELETED												
224	0	0	0	0	0	0	0	0	0	0	0	0
225	0	0	0	0	0	0	0	0	0	0	0	0
226	0	0	0	0	0	0	0	0	0	0	0	0
227	0	0	0	0	0	0	0	0	0	0	0	0
228	0	0	0	0	0	0	0	0	0	0	0	0
229	0	1	1	0	0	0	0	0	0	0	0	0
230	0	0	0	0	0	0	0	0	0	0	0	0
231	0	0	0	0	0	0	0	0	0	0	0	0
232	0	0	0	0	0	0	0	0	0	0	0	0
233	0	0	0	0	0	0	0	0	0	0	0	0
234	0	0	0	0	0	0	0	0	0	0	0	0
235	0	0	0	0	0	0	0	0	0	0	0	0
236	0	0	0	0	0	0	0	0	0	0	0	0
237	0	0	0	0	0	0	0	0	0	0	0	0
238	0	0	0	0	0	0	0	0	0	0	0	0
239	0	0	0	0	0	0	0	0	0	0	0	0
240	0	0	0	0	0	0	0	0	0	0	0	0
241	0	0	0	0	0	0	0	0	0	0	0	0
242	0	0	0	0	0	0	0	0	0	0	0	0
243	0	0	0	0	0	0	0	0	0	0	0	0
244	0	0	0	0	0	0	0	0	0	0	0	0
245	0	0	0	0	0	0	0	0	0	0	0	0
246	0	0	0	0	0	0	0	0	0	0	0	0
247	0	0	0	0	0	0	0	0	0	0	0	0
248	0	0	0	0	0	0	0	0	0	0	0	0
249	0	0	0	0	0	0	0	0	0	0	0	0
250	0	0	0	0	1	1	0	0	0	0	0	0
251	0	1	1	0	0	0	0	0	0	0	0	0
252	0	0	0	0	0	0	0	0	0	0	0	0
253	0	0	0	0	0	0	0	0	0	0	0	0
254	0	0	0	0	0	0	0	0	0	0	0	0
255	0	0	0	0	0	0	0	0	0	0	0	0
256	0	0	0	0	0	0	0	0	0	0	0	0

ID	VOUCHER	POTILL	DENSITY	VOUCHER	POTPRA	DENSITY	VOUCHER	POTROB	DENSITY	VOUCHER	POTZOS	DENSITY
1_DELETED												
2_DELETED												
3_DELETED												
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
6_DELETED												
7_DELETED												
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0
12_DELETED												
13_DELETED												
14	0	0	0	0	0	0	0	0	0	0	0	0
15_DELETED												
16	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	1	1	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	1	1	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	1	1	0	0	0	0	0	0
29	0	0	0	0	1	1	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
31_DELETED												
32	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	1	1	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	1	1	0	0	0	0	0	0
41	0	0	0	0	0	0	0	0	0	0	0	0
42	0	0	0	0	0	0	0	0	0	0	0	0
43	0	0	0	0	1	1	0	0	0	0	1	1
44	0	0	0	0	1	1	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	1	1
46	0	0	0	0	0	0	0	0	0	0	0	0
47	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	1	1	0	1	1
49	0	0	0	0	1	1	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0
51	0	0	0	0	1	1	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0	0	1	2
54	0	0	0	0	0	0	0	0	0	0	0	0
55	0	0	0	0	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0	0	0	0
57	0	0	0	0	0	0	0	0	0	0	0	0
58	0	0	0	0	1	1	0	0	0	0	0	0
59	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0
61	0	0	0	0	1	1	0	0	0	0	1	1
62	0	0	0	0	1	2	0	0	0	0	0	0
63	0	0	0	0	1	1	0	0	0	0	0	0
64	0	0	0	0	0	0	0	1	2	0	0	0
65	0	0	0	0	1	1	0	1	1	0	1	1
66	0	0	0	0	1	1	0	0	0	0	0	0
67	0	0	0	0	1	1	0	0	0	0	0	0
68	0	0	0	0	1	1	0	0	0	0	0	0
69	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	1	1	0	0	0	0	0	0
71	0	0	0	0	1	1	0	0	0	0	0	0
72	0	0	0	0	1	1	0	0	0	0	0	0
73	0	0	0	0	0	0	0	0	0	0	0	0

ID	VOUCHER	POTILL	DENSITY	VOUCHER	POTPRA	DENSITY	VOUCHER	POTROB	DENSITY	VOUCHER	POTZOS	DENSITY
74	0	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0	0
76	0	0	0	0	0	0	0	0	0	0	0	0
77_DELETED												
78	0	0	0	0	0	0	0	0	0	0	0	0
79	0	0	0	0	1	1	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0
81	0	0	0	0	1	2	0	0	0	0	0	0
82	0	0	0	0	1	2	0	0	0	0	0	0
83	0	0	0	0	0	0	0	0	0	0	0	0
84	0	0	0	0	0	0	0	0	0	0	0	0
85	0	0	0	0	0	0	0	0	0	0	0	0
86_DELETED												
87	0	0	0	0	1	1	0	0	0	0	0	0
88	0	0	0	0	0	0	0	0	0	0	0	0
89	0	0	0	0	1	1	0	0	0	0	1	1
90	0	0	0	0	1	1	0	0	0	0	1	1
91	0	0	0	0	1	1	0	0	0	0	1	1
92	0	0	0	0	1	1	0	0	0	0	1	1
93	0	0	0	0	0	0	0	0	0	0	1	1
94	0	0	0	0	1	2	0	1	1	0	0	0
95	0	0	0	0	1	1	0	0	0	0	0	0
96	0	0	0	0	0	0	0	0	0	0	0	0
97	0	0	0	0	0	0	0	0	0	0	0	0
98	0	0	0	0	1	1	0	0	0	0	0	0
99	0	0	0	0	1	1	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0
101	0	0	0	0	1	1	0	0	0	0	0	0
102	0	0	0	0	1	1	0	0	0	0	1	1
103	0	0	0	0	0	0	0	0	0	0	0	0
104	0	0	0	0	0	0	0	0	0	0	0	0
105	0	0	0	0	0	0	0	0	0	0	0	0
106	0	0	0	0	1	1	0	0	0	0	0	0
107	0	0	0	0	1	1	0	0	0	0	1	1
108	0	0	0	0	0	0	0	0	0	0	0	0
109	0	0	0	0	1	1	0	0	0	0	1	1
110	0	0	0	0	0	0	0	0	0	0	0	0
111	0	0	0	0	0	0	0	0	0	0	0	0
112	0	0	0	0	1	1	0	0	0	0	0	0
113	0	0	0	0	1	1	0	0	0	0	0	0
114	0	0	0	0	1	1	0	0	0	0	0	0
115	0	0	0	0	1	1	0	0	0	0	1	1
116	0	0	0	0	0	0	0	0	0	0	0	0
117	0	0	0	0	0	0	0	0	0	0	0	0
118	0	0	0	0	0	0	0	0	0	0	0	0
119	0	0	0	0	1	1	0	0	0	0	0	0
120	0	0	0	0	1	2	0	0	0	0	0	0
121	0	0	0	0	0	0	0	0	0	0	0	0
122	0	0	0	0	0	0	0	0	0	0	0	0
123	0	0	0	0	1	3	0	0	0	0	0	0
124	0	0	0	0	1	1	0	0	0	0	1	1
125	0	0	0	0	0	0	0	1	1	0	1	1
126	0	0	0	0	0	0	0	1	1	0	0	0
127	0	0	0	0	0	0	0	0	0	0	0	0
128	0	0	0	0	0	0	0	0	0	0	0	0
129	0	0	0	0	1	1	0	0	0	0	0	0
130	0	0	0	0	1	1	0	0	0	0	0	0
131	0	0	0	0	1	1	0	0	0	0	0	0
132	0	0	0	0	1	2	0	1	1	0	0	0
133	0	0	0	0	1	1	0	0	0	0	0	0
134	0	0	0	0	1	1	0	0	0	0	0	0
135	0	0	0	0	1	1	0	0	0	0	1	1
136	0	0	0	0	1	2	0	0	0	0	0	0
137	0	0	0	0	1	1	0	0	0	0	0	0
138	0	0	0	0	0	0	0	0	0	0	0	0
139	0	0	0	0	0	0	0	0	0	0	1	1
140	0	0	0	0	0	0	0	0	0	0	0	0
141	0	0	0	0	0	0	0	0	0	0	1	1
142	0	0	0	0	1	1	0	1	1	0	0	0
143	0	0	0	0	0	0	0	1	1	0	1	1
144	0	0	0	0	0	0	0	1	2	0	1	1
145	0	0	0	0	0	0	0	0	0	0	0	0
146	0	0	0	0	1	1	0	0	0	0	0	0

ID	VOUCHER	POTILL	DENSITY	VOUCHER	POTPRA	DENSITY	VOUCHER	POTROB	DENSITY	VOUCHER	POTZOS	DENSITY
147	0	0	0	0	0	0	0	0	0	0	0	0
148	0	0	0	0	0	0	0	0	0	0	0	0
149	0	0	0	0	1	1	0	0	0	0	0	0
150	0	0	0	0	0	0	0	1	1	0	0	0
151	0	0	0	0	0	0	0	0	0	0	0	0
152	0	0	0	0	1	1	0	0	0	0	0	0
153	0	0	0	0	1	1	0	0	0	0	0	0
154	0	0	0	0	0	0	0	0	0	0	0	0
155	0	0	0	0	1	1	0	0	0	0	0	0
156	0	0	0	0	0	0	0	0	0	0	0	0
157	0	0	0	0	1	1	0	0	0	0	0	0
158	0	0	0	0	0	0	0	0	0	0	0	0
159	0	0	0	0	0	0	0	0	0	0	0	0
160	0	0	0	0	1	3	0	1	1	0	1	1
161	0	0	0	0	0	0	0	1	2	0	1	1
162_DELETED												
163	0	0	0	0	0	0	0	0	0	0	0	0
164	0	0	0	0	1	1	0	0	0	0	0	0
165	0	0	0	0	0	0	0	1	1	0	0	0
166	0	0	0	0	0	0	0	0	0	0	0	0
167	0	0	0	0	1	1	0	1	1	0	0	0
168	0	0	0	0	0	0	0	0	0	0	0	0
169_DELETED												
170	0	0	0	0	0	0	0	0	0	0	1	1
171	0	0	0	0	1	1	0	0	0	0	0	0
172	0	0	0	0	1	1	0	0	0	0	0	0
173	0	0	0	0	0	0	0	0	0	0	0	0
174_DELETED												
175	0	0	0	0	0	0	0	0	0	0	1	1
176_DELETED												
177	0	0	0	0	0	0	0	0	0	0	1	1
178	0	0	0	0	0	0	0	1	1	0	1	1
179	0	0	0	0	1	3	0	1	2	0	1	1
180	0	0	0	0	1	1	0	1	2	0	1	1
181	0	0	0	0	0	0	0	1	2	0	1	1
182	0	0	0	0	0	0	0	0	0	0	0	0
183_DELETED												
184	0	0	0	0	0	0	0	0	0	0	0	0
185	0	0	0	0	1	1	0	0	0	0	0	0
186	0	0	0	0	1	1	0	0	0	0	0	0
187	0	0	0	0	1	1	0	0	0	0	0	0
188_DELETED												
189	0	0	0	0	0	0	0	0	0	0	0	0
190	0	0	0	0	0	0	0	0	0	0	0	0
191	0	0	0	0	0	0	0	1	3	0	0	0
192	0	0	0	0	0	0	0	0	0	0	0	0
193	0	0	0	0	1	1	0	0	0	0	0	0
194	0	0	0	0	0	0	0	0	0	0	0	0
195	0	0	0	0	0	0	0	0	0	0	0	0
196	0	0	0	0	0	0	0	0	0	0	0	0
197	0	0	0	0	0	0	0	0	0	0	0	0
198	0	0	0	0	0	0	0	0	0	0	0	0
199	0	0	0	0	1	1	0	1	1	0	1	1
200	0	0	0	0	0	0	0	0	0	0	1	1
201	0	0	0	0	0	0	0	1	1	0	0	0
202	0	0	0	0	0	0	0	0	0	0	0	0
203	0	0	0	0	1	1	0	1	1	0	0	0
204	0	0	0	0	1	1	0	0	0	0	0	0
205	0	0	0	0	0	0	0	0	0	0	0	0
206	0	0	0	0	0	0	0	0	0	0	0	0
207	0	0	0	0	0	0	0	0	0	0	0	0
208	0	0	0	0	0	0	0	0	0	0	0	0
209	0	0	0	0	0	0	0	1	1	0	1	1
210	0	0	0	0	0	0	0	1	2	0	0	0
211	0	0	0	0	0	0	0	0	0	0	0	0
212	0	0	0	0	0	0	0	1	1	0	0	0
213	0	0	0	0	0	0	0	1	1	0	0	0
214	0	0	0	0	0	0	0	1	2	0	0	0
215	0	0	0	0	0	0	0	0	0	0	0	0
216	0	0	0	0	0	0	0	0	0	0	0	0
217	0	0	0	0	0	0	0	0	0	0	0	0
218_DELETED												
219	0	0	0	0	0	0	0	1	1	0	1	1

ID	VOUCHER	POTILL	DENSITY	VOUCHER	POTPRA	DENSITY	VOUCHER	POTROB	DENSITY	VOUCHER	POTZOS	DENSITY
220	0	0	0	0	1	1	0	1	2	0	0	0
221	0	0	0	0	0	0	0	0	0	0	0	0
222	0	0	0	0	0	0	0	1	1	0	0	0
223_DELETED												
224	0	0	0	0	0	0	0	0	0	0	1	4
225	0	0	0	0	0	0	0	0	0	0	1	1
226	0	0	0	0	0	0	0	0	0	0	0	0
227	0	0	0	0	0	0	0	0	0	0	0	0
228	0	0	0	0	0	0	0	0	0	0	0	0
229	0	0	0	0	0	0	0	1	2	0	0	0
230	0	0	0	0	0	0	0	1	1	0	0	0
231	0	0	0	0	0	0	0	0	0	0	0	0
232	0	0	0	0	0	0	0	0	0	0	0	0
233	0	0	0	0	0	0	0	0	0	0	0	0
234	0	0	0	0	0	0	0	0	0	0	0	0
235	0	0	0	0	1	1	0	0	0	0	0	0
236	0	0	0	0	0	0	0	0	0	0	0	0
237	0	0	0	0	0	0	0	0	0	0	0	0
238	0	0	0	0	0	0	0	0	0	0	0	0
239	0	0	0	0	0	0	0	0	0	0	0	0
240	0	0	0	0	0	0	0	0	0	0	0	0
241	0	0	0	0	0	0	0	0	0	0	0	0
242	0	0	0	0	0	0	0	0	0	0	0	0
243	0	0	0	0	0	0	0	1	1	0	0	0
244	0	0	0	0	1	1	0	1	1	0	0	0
245	0	0	0	0	1	1	0	0	0	0	0	0
246	0	0	0	0	0	0	0	0	0	0	0	0
247	0	0	0	0	0	0	0	1	1	0	0	0
248	0	0	0	0	0	0	0	1	3	0	1	1
249	0	0	0	0	0	0	0	1	1	0	0	0
250	0	0	0	0	0	0	0	1	1	0	1	1
251	0	0	0	0	0	0	0	1	1	0	0	0
252	0	0	0	0	0	0	0	0	0	0	1	2
253	0	0	0	0	0	0	0	1	1	0	0	0
254	0	0	0	0	0	0	0	0	0	0	0	0
255	0	0	0	0	0	0	0	1	1	0	0	0
256	0	0	0	0	0	0	0	0	0	0	0	0

ID	VOUCHER	RANAQD	DENSITY	VOUCHER	SAGGRA?	DENSITY	VOUCHER	STUPEC	DENSITY	VOUCHER	UTRMAC	DENSITY
1_DELETED												
2_DELETED												
3_DELETED												
4	0	0	0	0	0	0	0	1	1	0	0	0
5	0	1	1	0	0	0	0	0	0	0	0	0
6_DELETED												
7_DELETED												
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0	1	1	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0
12_DELETED												
13_DELETED												
14	0	0	0	0	0	0	0	0	0	0	0	0
15_DELETED												
16	0	0	0	0	0	0	0	1	1	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	1	1	0	0	0	0	0	0
21	0	1	1	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
31_DELETED												
32	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0	0	0	1	1
39	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0
41	0	0	0	0	0	0	0	0	0	0	0	0
42	0	0	0	0	0	0	0	0	0	0	0	0
43	0	0	0	0	0	0	0	0	0	0	0	0
44	0	0	0	0	1	1	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0
46	0	0	0	0	0	0	0	0	0	0	0	0
47	0	0	0	0	1	4	0	0	0	0	0	0
48	0	0	0	0	1	1	0	0	0	0	0	0
49	0	0	0	0	0	0	0	1	1	0	0	0
50	0	0	0	0	0	0	0	1	1	0	0	0
51	0	0	0	0	0	0	0	1	1	0	0	0
52	0	0	0	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0	0	0	0
54	0	0	0	0	0	0	0	0	0	0	0	0
55	0	0	0	0	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0	0	0	0
57	0	0	0	0	1	1	0	0	0	0	0	0
58	0	0	0	0	0	0	0	0	0	0	0	0
59	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0	0	0	0
63	0	0	0	0	0	0	0	0	0	0	0	0
64	0	0	0	0	0	0	0	0	0	0	0	0
65	0	1	1	0	0	0	0	0	0	0	0	0
66	0	0	0	0	0	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	1	1	0	0	0
69	0	0	0	0	0	0	0	1	1	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0
71	0	1	1	0	0	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0	0	0	0	0	0
73	0	0	0	0	0	0	0	0	0	0	0	0

ID	VOUCHER	RANAQD	DENSITY	VOUCHER	SAGGRA?	DENSITY	VOUCHER	STUPEC	DENSITY	VOUCHER	UTRMAC	DENSITY
74	0	0	0	0	1	2	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0	0
76	0	0	0	0	1	1	0	0	0	0	0	0
77_DELETED												
78	0	0	0	0	0	0	0	0	0	0	0	0
79	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0
81	0	0	0	0	0	0	0	0	0	0	0	0
82	0	0	0	0	0	0	0	0	0	0	0	0
83	0	0	0	0	0	0	0	0	0	0	0	0
84	0	0	0	0	0	0	0	0	0	0	0	0
85	0	0	0	0	0	0	0	0	0	0	0	0
86_DELETED												
87	0	1	1	0	0	0	0	0	0	0	0	0
88	0	0	0	0	0	0	0	0	0	0	0	0
89	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0
91	0	1	1	0	0	0	0	0	0	0	0	0
92	0	1	1	0	0	0	0	0	0	0	0	0
93	0	1	1	0	0	0	0	0	0	0	0	0
94	0	1	1	0	0	0	0	0	0	0	0	0
95	0	0	0	0	0	0	0	0	0	0	0	0
96	0	0	0	0	1	1	0	0	0	0	0	0
97	0	0	0	0	0	0	0	0	0	0	0	0
98	0	0	0	0	0	0	0	0	0	0	0	0
99	0	0	0	0	1	2	0	0	0	0	0	0
100	0	0	0	0	1	3	0	0	0	0	0	0
101	0	0	0	0	0	0	0	0	0	0	0	0
102	0	0	0	0	0	0	0	0	0	0	0	0
103	0	0	0	0	0	0	0	0	0	0	0	0
104	0	0	0	0	0	0	0	0	0	0	0	0
105	0	0	0	0	0	0	0	0	0	0	0	0
106	0	0	0	0	0	0	0	0	0	0	0	0
107	0	1	1	0	0	0	0	0	0	0	0	0
108	0	0	0	0	0	0	0	0	0	0	0	0
109	0	0	0	0	0	0	0	0	0	0	0	0
110	0	0	0	0	1	1	0	0	0	0	0	0
111	0	0	0	0	0	0	0	0	0	0	0	0
112	0	0	0	0	0	0	0	0	0	0	0	0
113	0	0	0	0	0	0	0	0	0	0	0	0
114	0	0	0	0	0	0	0	0	0	0	0	0
115	0	0	0	0	0	0	0	0	0	0	0	0
116	0	0	0	0	0	0	0	0	0	0	0	0
117	0	0	0	0	0	0	0	0	0	0	0	0
118	0	0	0	0	0	0	0	0	0	0	0	0
119	0	0	0	0	0	0	0	0	0	0	0	0
120	0	0	0	0	0	0	0	0	0	0	0	0
121	0	0	0	0	0	0	0	0	0	0	0	0
122	0	0	0	0	0	0	0	0	0	0	0	0
123	0	0	0	0	0	0	0	0	0	0	0	0
124	0	1	1	0	0	0	0	0	0	0	0	0
125	0	0	0	0	0	0	0	0	0	0	0	0
126	0	0	0	0	0	0	0	0	0	0	0	0
127	0	0	0	0	1	1	0	0	0	0	0	0
128	0	0	0	0	0	0	0	0	0	0	0	0
129	0	0	0	0	0	0	0	0	0	0	0	0
130	0	0	0	0	0	0	0	0	0	0	0	0
131	0	0	0	0	0	0	0	0	0	0	0	0
132	0	0	0	0	0	0	0	0	0	0	0	0
133	0	0	0	0	0	0	0	0	0	0	0	0
134	0	0	0	0	0	0	0	0	0	0	0	0
135	0	0	0	0	0	0	0	0	0	0	0	0
136	0	0	0	0	0	0	0	0	0	0	0	0
137	0	0	0	0	0	0	0	0	0	0	0	0
138	0	0	0	0	0	0	0	0	0	0	0	0
139	0	0	0	0	0	0	0	0	0	0	0	0
140	0	0	0	0	0	0	0	0	0	0	0	0
141	0	0	0	0	0	0	0	0	0	0	0	0
142	0	1	1	0	0	0	0	0	0	0	0	0
143	0	0	0	0	0	0	0	0	0	0	0	0
144	0	0	0	0	0	0	0	0	0	0	0	0
145	0	0	0	0	0	0	0	0	0	0	0	0
146	0	0	0	0	0	0	0	0	0	0	0	0

ID	VOUCHER	RANAQD	DENSITY	VOUCHER	SAGGRA?	DENSITY	VOUCHER	STUPEC	DENSITY	VOUCHER	UTRMAC	DENSITY
147	0	0	0	0	0	0	0	0	0	0	0	0
148	0	0	0	0	0	0	0	0	0	0	0	0
149	0	0	0	0	0	0	0	0	0	0	0	0
150	0	1	1	0	0	0	0	0	0	0	0	0
151	0	0	0	0	0	0	0	0	0	0	0	0
152	0	0	0	0	0	0	0	0	0	0	0	0
153	0	0	0	0	0	0	0	0	0	0	0	0
154	0	0	0	0	0	0	0	0	0	0	0	0
155	0	0	0	0	0	0	0	0	0	0	0	0
156	0	0	0	0	0	0	0	0	0	0	0	0
157	0	1	1	0	0	0	0	0	0	0	0	0
158	0	0	0	0	0	0	0	0	0	0	0	0
159	0	0	0	0	0	0	0	0	0	0	0	0
160	0	0	0	0	0	0	0	0	0	0	0	0
161	0	0	0	0	0	0	0	0	0	0	0	0
162_DELETED												
163	0	0	0	0	0	0	0	0	0	0	0	0
164	0	0	0	0	0	0	0	0	0	0	0	0
165	0	0	0	0	0	0	0	0	0	0	0	0
166	0	0	0	0	0	0	0	0	0	0	0	0
167	0	0	0	0	0	0	0	0	0	0	0	0
168	0	0	0	0	0	0	0	0	0	0	0	0
169_DELETED												
170	0	0	0	0	0	0	0	0	0	0	0	0
171	0	0	0	0	1	1	0	0	0	0	0	0
172	0	0	0	0	0	0	0	0	0	0	0	0
173	0	0	0	0	0	0	0	0	0	0	0	0
174_DELETED												
175	0	0	0	0	0	0	0	0	0	0	0	0
176_DELETED												
177	0	0	0	0	0	0	0	0	0	0	0	0
178	0	0	0	0	0	0	0	0	0	0	0	0
179	0	1	1	0	0	0	0	0	0	0	0	0
180	0	1	1	0	0	0	0	0	0	0	0	0
181	0	0	0	0	0	0	0	0	0	0	0	0
182	0	0	0	0	1	1	0	0	0	0	0	0
183_DELETED												
184	0	0	0	0	1	2	0	0	0	0	0	0
185	0	0	0	0	0	0	0	0	0	0	0	0
186	0	0	0	0	0	0	0	0	0	0	0	0
187	0	0	0	0	1	1	0	0	0	0	0	0
188_DELETED												
189	0	0	0	0	0	0	0	0	0	0	0	0
190	0	0	0	0	0	0	0	0	0	0	0	0
191	0	1	1	0	0	0	0	0	0	0	0	0
192	0	0	0	0	0	0	0	0	0	0	0	0
193	0	1	1	0	0	0	0	0	0	0	0	0
194	0	0	0	0	0	0	0	0	0	0	0	0
195	0	0	0	0	0	0	0	0	0	0	0	0
196	0	0	0	0	0	0	0	0	0	0	0	0
197	0	0	0	0	0	0	0	0	0	0	0	0
198	0	0	0	0	0	0	0	0	0	0	0	0
199	0	1	1	0	0	0	0	0	0	0	0	0
200	0	1	1	0	0	0	0	0	0	0	0	0
201	0	0	0	0	0	0	0	0	0	0	0	0
202	0	0	0	0	0	0	0	0	0	0	0	0
203	0	0	0	0	1	1	0	0	0	0	0	0
204	0	0	0	0	0	0	0	0	0	0	0	0
205	0	0	0	0	1	1	0	0	0	0	0	0
206	0	0	0	0	0	0	0	0	0	0	0	0
207	0	0	0	0	0	0	0	0	0	0	0	0
208	0	0	0	0	0	0	0	0	0	0	0	0
209	0	0	0	0	0	0	0	0	0	0	0	0
210	0	0	0	0	0	0	0	0	0	0	0	0
211	0	0	0	0	0	0	0	0	0	0	0	0
212	0	0	0	0	0	0	0	0	0	0	0	0
213	0	0	0	0	0	0	0	0	0	0	0	0
214	0	0	0	0	0	0	0	0	0	0	0	0
215	0	0	0	0	0	0	0	0	0	0	0	0
216	0	1	1	0	1	1	0	0	0	0	0	0
217	0	0	0	0	1	1	0	0	0	0	0	0
218_DELETED												
219	0	0	0	0	0	0	0	0	0	0	0	0

ID	VOUCHER	RANAQD	DENSITY	VOUCHER	SAGGRA?	DENSITY	VOUCHER	STUPEC	DENSITY	VOUCHER	UTRMAC	DENSITY
220	0	0	0	0	0	0	0	0	0	0	0	0
221	0	0	0	0	0	0	0	0	0	0	0	0
222	0	0	0	0	0	0	0	0	0	0	0	0
223_DELETED												
224	0	0	0	0	0	0	0	0	0	0	0	0
225	0	0	0	0	1	1	0	0	0	0	0	0
226	0	0	0	0	1	1	0	0	0	0	0	0
227	0	0	0	0	1	1	0	0	0	0	0	0
228	0	0	0	0	0	0	0	0	0	0	0	0
229	0	0	0	0	0	0	0	0	0	0	0	0
230	0	0	0	0	0	0	0	0	0	0	0	0
231	0	0	0	0	0	0	0	0	0	0	0	0
232	0	0	0	0	0	0	0	0	0	0	0	0
233	0	0	0	0	0	0	0	0	0	0	0	0
234	0	0	0	0	0	0	0	0	0	0	0	0
235	0	0	0	0	0	0	0	0	0	0	0	0
236	0	0	0	0	0	0	0	0	0	0	0	0
237	0	0	0	0	0	0	0	0	0	0	0	0
238	0	0	0	0	0	0	0	0	0	0	0	0
239	0	0	0	0	1	1	0	0	0	0	0	0
240	0	0	0	0	0	0	0	0	0	0	0	0
241	0	0	0	0	0	0	0	0	0	0	0	0
242	0	0	0	0	0	0	0	0	0	0	0	0
243	0	0	0	0	0	0	0	0	0	0	0	0
244	0	0	0	0	0	0	0	0	0	0	0	0
245	0	0	0	0	0	0	0	0	0	0	0	0
246	0	0	0	0	0	0	0	0	0	0	0	0
247	0	0	0	0	1	1	0	0	0	0	0	0
248	0	0	0	0	0	0	0	0	0	0	0	0
249	0	0	0	0	0	0	0	0	0	0	0	0
250	0	0	0	0	0	0	0	0	0	0	0	0
251	0	0	0	0	0	0	0	0	0	0	0	0
252	0	1	1	0	0	0	0	0	0	0	0	0
253	0	0	0	0	0	0	0	0	0	0	0	0
254	0	0	0	0	0	0	0	0	0	0	0	0
255	0	0	0	0	0	0	0	0	0	0	0	0
256	0	0	0	0	0	0	0	0	0	0	0	0

ID	VOUCHER	VALAME	DENSITY	VOUCHER	
1_DELETED					
2_DELETED					
3_DELETED					
4	0	1	1	0	
5	0	0	0	0	
6_DELETED					
7_DELETED					
8	0	0	0	0	
9	0	0	0	0	
10	0	0	0	0	
11	0	1	1	0	
12_DELETED					
13_DELETED					
14	0	0	0	0	(90% Surface coverage of NYMODT)
15_DELETED					
16	0	1	1	0	
17	0	0	0	0	
18	0	0	0	0	
19	0	0	0	0	
20	0	1	1	0	
21	0	1	1	0	
22	0	0	0	0	
23	0	1	1	0	
24	0	1	1	0	
25	0	0	0	0	
26	0	0	0	0	
27	0	1	2	0	ZM
28	0	1	1	0	
29	0	1	1	0	
30	0	0	0	0	
31_DELETED					
32	0	1	1	0	
33	0	1	1	0	
34	0	0	0	0	
35	0	1	1	0	
36	0	1	2	0	
37	0	1	1	0	Fil. Algae
38	0	0	0	0	(50% surface coverage of NYMODT & NUPADV)
39	0	0	0	0	
40	0	1	1	0	
41	0	0	0	0	
42	0	0	0	0	
43	0	1	1	0	
44	0	1	2	0	
45	0	1	1	0	
46	0	1	2	0	
47	0	1	1	0	
48	0	0	0	0	
49	0	1	2	0	
50	0	1	1	0	
51	0	0	0	0	
52	0	0	0	0	
53	0	1	3	0	
54	0	1	1	0	
55	0	0	0	0	
56	0	0	0	0	
57	0	0	0	0	
58	0	1	1	0	
59	0	0	0	0	
60	0	0	0	0	
61	0	1	1	0	
62	0	1	1	0	ZM
63	0	1	2	0	
64	0	1	1	0	
65	0	1	2	0	
66	0	1	2	0	
67	0	1	1	0	
68	0	1	1	0	
69	0	1	1	0	
70	0	1	2	0	ZM
71	0	1	1	0	
72	0	1	2	0	
73	0	1	3	0	

ID	VOUCHER	VALAME	DENSITY	VOUCHER	
74	0	1	2	0	
75	0	1	1	0	
76	0	1	1	0	
77_DELETED					
78	0	1	1	0	
79	0	1	2	0	
80	0	0	0	0	
81	0	1	2	0	
82	0	1	2	0	
83	0	0	0	0	
84	0	0	0	0	
85	0	1	1	0	
86_DELETED					
87	0	1	4	0	
88	0	0	0	0	
89	0	1	3	0	ZM
90	0	1	3	0	ZM
91	0	1	2	0	ZM
92	0	1	2	0	ZM
93	0	1	3	0	ZM
94	0	1	2	0	
95	0	1	1	0	
96	0	1	1	0	
97	0	1	2	0	
98	0	0	0	0	
99	0	0	0	0	
100	0	1	1	0	
101	0	1	2	0	
102	0	1	1	0	
103	0	0	0	0	
104	0	0	0	0	
105	0	0	0	0	
106	0	0	0	0	
107	0	1	3	0	
108	0	0	0	0	
109	0	1	3	0	ZM
110	0	1	1	0	
111	0	1	3	0	
112	0	1	1	0	
113	0	1	2	0	
114	0	0	0	0	
115	0	1	1	0	
116	0	0	0	0	
117	0	0	0	0	
118	0	0	0	0	
119	0	1	1	0	
120	0	1	3	0	
121	0	0	0	0	
122	0	0	0	0	
123	0	0	0	0	
124	0	1	2	0	
125	0	0	0	0	ZM
126	0	1	3	0	
127	0	1	1	0	
128	0	1	1	0	
129	0	1	2	0	
130	0	1	2	0	
131	0	0	0	0	
132	0	1	1	0	
133	0	1	1	0	
134	0	1	2	0	
135	0	1	2	0	
136	0	1	1	0	
137	0	1	1	0	
138	0	1	1	0	
139	0	1	1	0	
140	0	0	0	0	
141	0	1	1	0	
142	0	1	2	0	ZM
143	0	1	2	0	
144	0	1	1	0	
145	0	1	1	0	
146	0	1	3	0	

ID	VOUCHER	VALAME	DENSITY	VOUCHER	
147	0	0	0	0	
148	0	0	0	0	
149	0	1	1	0	
150	0	1	1	0	
151	0	0	0	0	
152	0	1	2	0	
153	0	1	2	0	
154	0	1	2	0	
155	0	1	2	0	
156	0	0	0	0	
157	0	1	3	0	ZM
158	0	0	0	0	
159	0	0	0	0	
160	0	1	1	0	ZM
161	0	1	2	0	
162_DELETED					
163	0	1	1	0	
164	0	1	3	0	
165	0	1	1	0	
166	0	0	0	0	
167	0	1	1	0	
168	0	1	3	0	
169_DELETED					
170	0	1	1	0	
171	0	1	1	0	
172	0	0	0	0	
173	0	1	2	0	
174_DELETED					
175	0	1	1	0	
176_DELETED					
177	0	1	1	0	ZM
178	0	1	1	0	ZM
179	0	1	1	0	ZM
180	0	1	2	0	
181	0	1	2	0	
182	0	0	0	0	
183_DELETED					
184	0	1	1	0	
185	0	1	3	0	
186	0	1	3	0	
187	0	1	2	0	
188_DELETED					
189	0	0	0	0	
190	0	1	1	0	
191	0	0	0	0	
192	0	0	0	0	
193	0	1	1	0	
194	0	1	4	0	ZM
195	0	1	1	0	ZM
196	0	0	0	0	
197	0	0	0	0	
198	0	1	1	0	ZM
199	0	1	1	0	ZM
200	0	1	2	0	
201	0	1	2	0	
202	0	1	1	0	
203	0	1	1	0	
204	0	1	1	0	
205	0	1	0	0	
206	0	0	0	0	
207	0	1	1	0	
208	0	0	0	0	
209	0	1	2	0	ZM
210	0	1	1	0	ZM
211	0	1	1	0	ZM
212	0	1	1	0	ZM
213	0	1	1	0	
214	0	1	2	0	
215	0	1	1	0	
216	0	1	1	0	
217	0	1	1	0	
218_DELETED					
219	0	1	1	0	ZM

ID	VOUCHER	VALAME	DENSITY	VOUCHER	
220	0	1	2	0	ZM
221	0	0	0	0	
222	0	1	2	0	ZM
223_DELETED					
224	0	1	1	0	
225	0	1	1	0	
226	0	1	1	0	
227	0	1	1	0	ZM
228	0	1	1	0	
229	0	1	1	0	
230	0	1	4	0	
231	0	0	0	0	
232	0	0	0	0	
233	0	0	0	0	
234	0	0	0	0	
235	0	1	4	0	
236	0	1	1	0	
237	0	0	0	0	
238	0	1	2	0	
239	0	0	0	0	
240	0	0	0	0	
241	0	0	0	0	
242	0	0	0	0	
243	0	0	0	0	
244	0	1	1	0	
245	0	1	1	0	
246	0	1	1	0	
247	0	0	0	0	
248	0	1	2	0	ZM
249	0	1	1	0	ZM
250	0	1	1	0	
251	0	1	2	0	
252	0	1	1	0	
253	0	1	1	0	
254	0	1	1	0	
255	0	1	1	0	ZM
256	0	1	1	0	

	BIDBEC	DENSITY	VOUCHER	CERDEM	DENSITY	VOUCHER	CHACON	DENSITY	VOUCHER	CHAFOL	DENSITY	VOUCHER	CHAGLO	DENSITY
Total observations	22	22	0	60	81	0	5	5	0	1	1	0	1	1
Frequency	0.09	0.09	0.00	0.25	0.34	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00
Frequency (%)														
Relative frequency														
Relative frequency (%)														

	VOUCHER	ELOCAN	DENSITY	VOUCHER	HETDUB	DENSITY	VOUCHER	MYRHET	DENSITY	VOUCHER	MYRSPI	DENSITY	VOUCHER	MYR?
Total observations	0	90	123	0	32	34	0	5	5	0	14	16	0	22
Frequency	0.00	0.38	0.52	0.00	0.14	0.14	0.00	0.02	0.02	0.00	0.06	0.07	0.00	0.09
Frequency (%)														
Relative frequency														
Relative frequency (%)														

	DENSITY	VOUCHER	NAJFLE	DENSITY	VOUCHER	NUPADV	DENSITY	VOUCHER	NYMODT	DENSITY	VOUCHER	POTGRA/ILL?	DENSITY
Total observations	22	0	72	80	0	1	1	1	2	2	0	24	25
Frequency	0.09	0.00	0.30	0.34	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.10	0.11
Frequency (%)													
Relative frequency													
Relative frequency (%)													

	VOUCHER	POTAMP	DENSITY	VOUCHER	POTFRI	DENSITY	VOUCHER	POTGRA	DENSITY	VOUCHER	POTILL	DENSITY	VOUCHER	POTPRA
Total observations	0	4	4	0	1	1	0	1	1	0	0	0	0	79
Frequency	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33
Frequency (%)														
Relative frequency														
Relative frequency (%)														

	DENSITY	VOUCHER	POTROB	DENSITY	VOUCHER	POTZOS	DENSITY	VOUCHER	RANAQD	DENSITY	VOUCHER	SAGGRA?	DENSITY	VOUCHER
Total observations	92	0	43	57	0	40	45	0	23	23	0	25	33	0
Frequency	0.39	0.00	0.18	0.24	0.00	0.17	0.19	0.00	0.10	0.10	0.00	0.11	0.14	0.00
Frequency (%)														
Relative frequency														
Relative frequency (%)														

	STUPEC	DENSITY	VOUCHER	UTRMAC	DENSITY	VOUCHER	VALAME	DENSITY	VOUCHER
Total observations	7	7	0	1	1	0	163	251	0
Frequency	0.03	0.03	0.00	0.00	0.00	0.00	0.69	1.06	0.00
Frequency (%)									
Relative frequency									
Relative frequency (%)									

	BIDBEC	CERDEM	CHACON	CHAFOL	CHAGLO	ELOCAN	HETDUB	MYRHET	MYRSPI	MYR?	NAJFLE	NUPADV	NYMODT	POTGRA/ILL
Total observatioı	22	60	5	1	1	90	32	5	14	22	72	1	2	24
Frequency	0.093	0.253	0.021	0.004	0.004	0.380	0.135	0.021	0.059	0.093	0.304	0.004	0.008	0.101
Frequency (%)	9.3	25.3	2.1	0.4	0.4	38.0	13.5	2.1	5.9	9.3	30.4	0.4	0.8	10.1
Relative frequen	0.030	0.081	0.007	0.001	0.001	0.122	0.043	0.007	0.019	0.030	0.098	0.001	0.003	0.033
Relative frequen	3.0	8.1	0.7	0.1	0.1	12.2	4.3	0.7	1.9	3.0	9.8	0.1	0.3	3.3

Mean No. Taxa

3.12

	POTAMP	POTFRI	POTGRA	POTILL	POTPRA	POTROB	POTZOS	RANAQD	SAGGRA?	STUPEC	UTRMAC	VALAME
Total observatior	4	1	1	0	79	43	40	23	25	7	1	163
Frequency	0.017	0.004	0.004	0.000	0.333	0.181	0.169	0.097	0.105	0.030	0.004	0.688
Frequency (%)	1.7	0.4	0.4	0.0	33.3	18.1	16.9	9.7	10.5	3.0	0.4	68.8
Relative frequen	0.005	0.001	0.001	0.000	0.107	0.058	0.054	0.031	0.034	0.009	0.001	0.221
Relative frequen	0.5	0.1	0.1	0.0	10.7	5.8	5.4	3.1	3.4	0.9	0.1	22.1

Mean No. Taxa

3.12

	BIDBEC	CERDEM	CHACON	CHAFOL	CHAGLO	ELOCAN	HETDUB	MYRHET	MYRSPI	MYR?	NAJFLE	NUPADV	NYMODT
Total No. Observations	22	60	5	1	1	90	32	5	14	22	72	1	2
Total density	22	81	5	1	1	123	34	5	16	22	80	1	2
Average density	1.0	1.4	1.0	1.0	1.0	1.4	1.1	1.0	1.1	1.0	1.1	1.0	1.0

Overall
<u>Mean density</u>
2.52

	POTGRA/ILL	POTAMP	POTFRI	POTGRA	POTILL	POTPRA	POTROB	POTZOS	RANAQD	SAGGRA?	STUPEC	UTRMAC	VALAME
Total No. Observations	24	4	1	1	0	79	43	40	23	25	7	1	163
Total density	25	4	1	1	0	92	57	45	23	33	7	1	251
Average density	1.0	1.0	1.0	1.0	#DIV/0!	1.2	1.3	1.1	1.0	1.3	1.0	1.0	1.5

Overall
Mean density
2.52

	BIDBEC	CERDEM	CHACON	CHAFOL	CHAGLO	ELOCAN	HETDUB	MYRHET	MYRSPI	MYR?	NAJFLE	NUPADV	NYMODT	POTGRA/ILL	POTAMP	POTFRI	POTGRA
Rothrock	10	1				3	4	7			5	6	6		10	10	7
A & S	10	1	2	7	4	3	5	5			5	3	5		7	7	5

	POTILL	POTPRA	POTROB	POTZOS	RANAQD	SAGGRA?	STUPEC	UTRMAC	VALAME	Csum	N	Cmean	I
Rothrock	7	10	10	8	7	9	3	5	7	135	20	6.8	30.2
A & S	4	8	10	4	5	9	2	4	4	119	23	5.2	24.8

DATE:	July 20, 2006	*Collected by Purdue North Central*
Lake Name:	Stone Lake	Collectors: Robin Scribailo, Mitchell Alix, and Amanda Lakatos
Lake ID:	INK01P1031_00	

Depth Below	Temp ° C	DO (%)	DO (mg/L)	Conductivity uS
1	27.7	90.6	7.13	250.0
2	27.6	90.0	7.05	250.0
3	27.5	86.3	6.79	250.9
4	26.4	81.8	6.56	258.0
5	23.8	79.4	6.53	266.6
6	21.3	73.7	6.45	272.0
7	17.7	38.9	3.67	277.3
8	15.7	0.5	0.05	282.8
9	14.0	0.5	0.05	290.4
10	13.1	0.4	0.04	296.6
11	13.0	0.3	0.03	325.3
12	13.0	0.3	0.03	353.3

Overall Depth:	10.5 m (34.4 ft)
Secchi Disk Depth	5.1 m (16.7 ft)

Light measurements			
In Air	0.25	Units:	3000
3 ft below Surface:	0.07	Units:	3000
1% Depth:	3.7 m (12.14 ft)	Units:	3000

pH Measurements		Temp (° C)
1 m Below Surface:	8.84	27.7
1m Above Bottom:	6.92	13.9

ID	DATE	Easting	Northing	No. TAXA	SEDIMENT	Meters	Feet	DENSITY	BIDBEC
1	7/26/2006	3043243.0	2317273.0	4	Muck	0.4	1.3	3	0
2	7/26/2006	3043243.0	2317453.0	5	Muck	1.2	3.9	2	0
3	7/26/2006	3043243.0	2317633.0	7	Muck	1.7	5.6	3	0
4	7/26/2006	3043243.0	2317813.0	3	Muck	2.0	6.6	3	0
5	7/26/2006	3043243.0	2317993.0	3	Muck	1.9	6.2	2	0
6	7/26/2006	3043243.0	2318173.0	3	Sand	0.8	2.6	3	0
7	7/26/2006	3043423.0	2317273.0	3	Muck	2.5	8.2	3	0
8	7/26/2006	3043423.0	2317453.0	0	Muck	5.8	19.0	0	0
9_DELETED	7/26/2006	3043423.0	2317993.0						
10	7/26/2006	3043423.0	2318173.0	0	Muck	5.8	19.0	0	0
11	7/26/2006	3043423.0	2318353.0	3	Muck	3.1	10.2	1	0
12	7/26/2006	3043423.0	2318533.0	3	Sand	0.4	1.3	4	0
13	7/26/2006	3043603.0	2317273.0	2	Muck	4.4	14.4	1	0
14	7/26/2006	3043603.0	2318533.0	2	Muck	5.8	19.0	1	0
15	7/26/2006	3043603.0	2318713.0	5	Muck	1.1	3.6	5	0
16	7/26/2006	3043783.0	2317273.0	5	Muck	0.9	3.0	5	0
17	7/27/2006	3043783.0	2317453.0	1	Muck	5.2	17.1	5	0
18	7/26/2006	3043783.0	2318713.0	2	Sand	4.7	15.4	1	0
19	7/26/2006	3043783.0	2318893.0	4	Sand	0.5	1.6	2	0
20_DELETED	7/26/2006	3043963.0	2317273.0						
21	7/27/2006	3043963.0	2317453.0	5	Muck	1.2	3.9	5	0
22	7/27/2006	3043963.0	2317633.0	4	Muck	5.7	18.7	3	0
23_DELETED	7/27/2006	3043963.0	2317813.0						
24_DELETED	7/26/2006	3043963.0	2318713.0						
25	7/26/2006	3043963.0	2318893.0	5	Muck	3.5	11.5	3	0
26	7/26/2006	3043963.0	2319073.0	2	Sand	0.3	1.0	1	0
27	7/27/2006	3044143.0	2317453.0	3	Muck	0.7	2.3	5	0
28	7/27/2006	3044143.0	2317633.0	2	Muck	4.4	14.4	1	0
29	7/27/2006	3044143.0	2317813.0	2	Muck	4.3	14.1	3	0
30	7/27/2006	3044143.0	2317993.0	6	Muck	1.7	5.6	3	0
31	7/26/2006	3044143.0	2318893.0	0	Muck	5.6	18.4	0	0
32	7/26/2006	3044143.0	2319073.0	5	Muck	1.7	5.6	2	0
33	7/26/2006	3044143.0	2319253.0	2	Muck	0.8	2.6	1	0
34	7/31/2006	3044323.0	2317633.0	5	Muck	1.1	3.6	5	0
35	7/31/2006	3044323.0	2317813.0	6	Muck	1.4	4.6	4	0
36	7/27/2006	3044323.0	2317993.0	5	Muck	2.5	8.2	2	0
37_DELETED	7/27/2006	3044323.0	2318893.0						
38	7/27/2006	3044323.0	2319073.0	6	Muck	1.8	5.9	3	0
39	7/27/2006	3044323.0	2319253.0	6	Muck	1.1	3.6	5	0
40	7/31/2006	3044503.0	2317633.0	6	Muck	1.0	3.1	4	0
41	7/27/2006	3044503.0	2317813.0	3	Muck	4.8	15.7	2	0
42	7/27/2006	3044503.0	2319073.0	4	Muck	2.1	6.9	4	0
43	7/27/2006	3044503.0	2319253.0	5	Muck	1.5	4.9	3	0
44	7/31/2006	3044683.0	2317633.0	7	Muck	1.2	3.9	5	1
45_DELETED	7/27/2006	3044683.0	2317813.0						
46	7/27/2006	3044683.0	2319253.0	6	Muck	2.8	9.2	2	0
47	7/27/2006	3044683.0	2319433.0	5	Muck	1.1	3.6	5	0
48	7/31/2006	3044863.0	2317633.0	5	Muck	1.4	4.6	5	0
49_DELETED	7/27/2006	3044863.0	2317813.0						
50_DELETED	7/27/2006	3044863.0	2319073.0						
51	7/27/2006	3044863.0	2319253.0	0	Muck	6.0	19.7	0	0
52	7/27/2006	3045583.0	2319073.0	7	Muck	1.4	4.6	4	1
53	7/27/2006	3044863.0	2319433.0	7	Muck	3.4	11.2	4	0

ID	DATE	Easting	Northing	No. TAXA	SEDIMENT	Meters	Feet	DENSITY	BIDBEC
54	7/27/2006	3044863.0	2319613.0	5	Muck	1.0	3.3	4	0
55	7/27/2006	3044863.0	2319793.0	2	Muck	0.5	1.6	1	0
56	7/31/2006	3045043.0	2317453.0	7	Muck	0.6	2.0	1	1
57	7/31/2006	3045043.0	2317633.0	7	Muck	1.3	4.3	5	0
58	7/27/2006	3045043.0	2317813.0	0	Muck	4.3	14.1	0	0
59_DELETED	7/27/2006	3045043.0	2318713.0						
60_DELETED	7/27/2006	3045043.0	2318893.0						
61	7/27/2006	3045043.0	2319073.0	6	Muck	4.3	14.1	5	0
62	7/27/2006	3045043.0	2319253.0	6	Muck	2.6	8.5	3	0
63	7/27/2006	3045043.0	2319433.0	5	Muck	1.7	5.6	5	0
64	7/27/2006	3045043.0	2319613.0	6	Muck	1.3	4.3	4	0
65	7/27/2006	3045043.0	2319793.0	6	Muck	1.1	3.6	5	0
66	7/31/2006	3045223.0	2317273.0	4	Muck	0.3	1.0	1	0
67	7/31/2006	3045223.0	2317453.0	5	Muck	0.6	2.0	5	1
68	7/31/2006	3045223.0	2317633.0	7	Muck	1.2	3.9	5	0
69	7/27/2006	3045223.0	2317813.0	6	Muck	1.8	5.9	5	0
70_DELETED	7/27/2006	3045223.0	2317993.0						
71_DELETED	7/27/2006	3045223.0	2318533.0						
72	7/27/2006	3045223.0	2318713.0	3	Muck	4.0	13.1	1	0
73	7/27/2006	3045223.0	2318893.0	5	Muck	2.6	8.5	3	0
74	7/27/2006	3045223.0	2319073.0	6	Muck	1.7	5.6	3	0
75	7/27/2006	3045223.0	2319253.0	5	Muck	1.4	4.6	2	0
76	7/27/2006	3045223.0	2319433.0	6	Muck	1.5	4.9	4	1
77	7/27/2006	3045223.0	2319613.0	6	Muck	1.4	4.6	5	1
78	7/27/2006	3045223.0	2319793.0	6	Muck	1.3	4.3	4	0
79_DELETED	7/27/2006	3045223.0	2319973.0						
80	7/31/2006	3045403.0	2317273.0	3	Muck	0.2	0.7	1	0
81	7/31/2006	3045403.0	2317453.0	5	Muck	0.6	2.0	3	1
82	7/31/2006	3045403.0	2317633.0	4	Muck	1.0	3.3	5	0
83	7/27/2006	3045403.0	2317813.0	7	Muck	1.2	3.9	5	0
84	7/27/2006	3045403.0	2317993.0	5	Muck	2.4	7.9	4	0
85_DELETED	7/27/2006	3045403.0	2318173.0						
86	7/27/2006	3045403.0	2318353.0	0	Muck	6.1	20.0	0	0
87	7/27/2006	3045403.0	2318533.0	5	Muck	3.3	10.8	5	0
88	7/27/2006	3045403.0	2318713.0	6	Muck	1.8	5.9	3	0
89	7/27/2006	3045403.0	2318893.0	6	Muck	1.7	5.6	5	0
90	7/27/2006	3045403.0	2319073.0	5	Muck	1.4	4.6	3	0
91	7/27/2006	3045403.0	2319253.0	5	Muck	1.4	4.6	4	0
92	7/27/2006	3045403.0	2319433.0	1	Muck	3.6	11.8	5	0
93	7/27/2006	3045403.0	2319613.0	1	Muck	4.9	16.1	1	0
94	7/27/2006	3045403.0	2319793.0	3	Muck	1.5	4.9	3	0
95	7/27/2006	3045403.0	2319973.0	2	Sand	0.3	1.0	1	0
96_DELETED	7/31/2006	3045583.0	2317453.0						
97_DELETED	7/31/2006	3045583.0	2317633.0						
98	7/27/2006	3045583.0	2317813.0	1	Sand	0.1	0.3	1	0

ID	DATE	Easting	Northing	No. TAXA	SEDIMENT	Meters	Feet	DENSITY	BIDBEC
99	7/27/2006	3045583.0	2317993.0	4	Muck	1.1	3.6	5	0
100	7/27/2006	3045583.0	2318173.0	7	Muck	1.6	5.2	4	0
101	7/27/2006	3045583.0	2318353.0	8	Muck	1.7	5.6	5	0
102	7/27/2006	3045583.0	2318533.0	7	Muck	1.7	5.6	5	0
103	7/27/2006	3045583.0	2318713.0	6	Muck	1.5	4.9	3	1
104	7/27/2006	3045583.0	2318893.0	8	Muck	1.5	4.9	4	1
105	7/27/2006	3045583.0	2319073.0	1	Muck	4.8	15.7	2	0
106	7/27/2006	3045583.0	2319793.0	5	Muck	1.1	3.4	5	1
107	7/27/2006	3045583.0	2319973.0	3	Sand	0.3	1.0	1	0
108	7/27/2006	3045763.0	2318353.0	1	Sand	0.2	0.7	1	0
109_DELETED	7/27/2006	3045763.0	2318533.0						
110	7/27/2006	3045763.0	2318893.0	4	Sand	0.7	2.3	1	0
111	7/27/2006	3045763.0	2319073.0	9	Muck	1.4	4.6	4	1
112_DELETED	7/27/2006	3045763.0	2319793.0						
113	7/26/2006	3045763.0	2319973.0	9	Muck	1.2	3.9	5	1
114	7/27/2006	3045943.0	2318713.0	10	Muck	0.8	2.5	4	1
115	7/27/2006	3045943.0	2318893.0	8	Muck	1.1	3.6	4	1
116_DELETED	7/26/2006	3045943.0	2319793.0						
117	7/26/2006	3045943.0	2319973.0	1	Sand	0.4	1.3	1	0
118	7/27/2006	3046123.0	2318533.0	8	Muck	0.3	1.0	2	0
119	7/27/2006	3046123.0	2318713.0	7	Muck	1.0	3.3	3	1
120	7/27/2006	3046123.0	2318893.0	0	Sand	6.0	19.7	0	0
121	7/26/2006	3046123.0	2319793.0	9	Sand	1.2	3.9	4	1
122	7/27/2006	3046303.0	2318533.0	9	Muck	0.3	1.0	3	0
123	7/27/2006	3046303.0	2318713.0	6	Muck	0.9	2.8	4	1
124	7/27/2006	3046303.0	2318893.0	6	Muck	1.6	5.2	5	1
125	7/26/2006	3046303.0	2319073.0	7	Muck	1.7	5.4	5	0
126	7/26/2006	3046303.0	2319253.0	7	Muck	1.5	4.9	3	1
127	7/26/2006	3046303.0	2319433.0	4	Muck	1.5	4.9	4	0
128	7/26/2006	3046303.0	2319613.0	7	Muck	0.8	2.6	5	1
129_DELETED	7/27/2006	3046483.0	2318533.0						
130	7/27/2006	3046483.0	2318713.0	4	Muck	0.4	1.3	4	1
131	7/27/2006	3046483.0	2318893.0	4	Muck	0.8	2.6	5	1
132	7/26/2006	3046483.0	2319073.0	6	Muck	0.9	2.8	5	0
133	7/26/2006	3046483.0	2319253.0	7	Sand	0.5	1.6	1	0

7 points deleted

DELETED	No explanation in field notes
DELETED	Not sampled because point was on shore
DELETED	Not sampled because depth was over 20 feet

Contour (ft)	Samples
0 to 5	66
5 to 10	23
10 to 15	11
15 to 20	13
20 to 25	11
25 to 30	2

ID	BIDBEC	DENSITY	VOUCHER	CERDEM	DENSITY	VOUCHER	CHAFOL	DENSITY	VOUCHER	CHAGLO	DENSITY
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	1	1	0	0	0	0	0	0
3	0	0	0	1	1	0	0	0	0	0	0
4	0	0	0	1	1	0	0	0	0	0	0
5	0	0	0	1	1	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	1	1	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0
9_DELETED											
10	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	1	1	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	1	1	0	0	0	0	0	0
14	0	0	0	1	1	0	0	0	0	0	0
15	0	0	0	1	1	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	1	5	0	0	0	0	0	0
18	0	0	0	1	1	0	0	0	0	0	0
19	0	0	0	1	1	0	0	0	0	0	0
20_DELETED											
21	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	1	1	0	0	0	0	0	0
23_DELETED											
24_DELETED											
25	0	0	0	1	2	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	1	1	0	0	0	0	0	0
29	0	0	0	1	3	0	0	0	0	0	0
30	0	0	0	1	1	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	1	1	0	0	0	0	0	0
37_DELETED											
38	0	0	0	1	1	0	0	0	0	0	0
39	0	0	0	1	1	0	0	0	0	0	0
40	0	0	0	1	1	0	0	0	0	0	0
41	0	0	0	1	1	0	0	0	0	0	0
42	0	0	0	1	1	0	0	0	0	0	0
43	0	0	0	1	1	0	0	0	0	0	0
44	1	1	0	0	0	0	0	0	0	0	0
45_DELETED											
46	0	0	0	1	1	0	0	0	0	0	0
47	0	0	0	1	1	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0
49_DELETED											
50_DELETED											
51	0	0	0	0	0	0	0	0	0	0	0
52	1	1	0	0	0	0	0	0	0	0	0
53	0	0	0	1	2	0	0	0	0	0	0

ID	BIDBEC	DENSITY	VOUCHER	CERDEM	DENSITY	VOUCHER	CHAFOL	DENSITY	VOUCHER	CHAGLO	DENSITY
54	0	0	0	0	0	0	0	0	0	0	0
55	0	0	0	0	0	0	0	0	0	0	0
56	1	1	0	0	0	0	0	0	0	0	0
57	0	0	0	1	1	0	0	0	0	0	0
58	0	0	0	0	0	0	0	0	0	0	0
59_DELETED											
60_DELETED											
61	0	0	0	1	4	0	0	0	0	0	0
62	0	0	0	1	1	0	0	0	0	0	0
63	0	0	0	1	1	0	0	0	0	0	0
64	0	0	0	1	1	0	0	0	0	0	0
65	0	0	0	1	1	0	0	0	0	0	0
66	0	0	0	0	0	0	0	0	0	0	0
67	1	1	0	0	0	0	0	0	0	0	0
68	0	0	0	1	1	0	0	0	0	0	0
69	0	0	0	1	1	0	0	0	0	0	0
70_DELETED											
71_DELETED											
72	0	0	0	0	0	0	0	0	0	0	0
73	0	0	0	1	1	0	0	0	0	0	0
74	0	0	0	1	1	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0
76	1	1	0	0	0	0	0	0	0	0	0
77	1	1	0	1	1	0	0	0	0	0	0
78	0	0	0	1	1	0	0	0	0	0	0
79_DELETED											
80	0	0	0	0	0	0	0	0	0	0	0
81	1	1	0	0	0	0	0	0	0	0	0
82	0	0	0	0	0	0	0	0	0	0	0
83	0	0	0	1	1	0	0	0	0	0	0
84	0	0	0	1	1	0	0	0	0	0	0
85_DELETED											
86	0	0	0	0	0	0	0	0	0	0	0
87	0	0	0	1	1	0	0	0	0	0	0
88	0	0	0	1	1	0	0	0	0	0	0
89	0	0	0	1	1	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0
91	0	0	0	0	0	0	0	0	0	0	0
92	0	0	0	1	5	0	0	0	0	0	0
93	0	0	0	1	1	0	0	0	0	0	0
94	0	0	0	1	1	0	0	0	0	0	0
95	0	0	0	0	0	0	0	0	0	0	0
96_DELETED											
97_DELETED											
98	0	0	0	0	0	0	0	0	0	0	0
99	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	1	2	0	0	0	0	0	0
101	0	0	0	1	1	0	0	0	0	0	0
102	0	0	0	1	1	0	0	0	0	0	0
103	1	1	0	1	1	0	0	0	0	0	0
104	1	1	0	1	1	0	0	0	0	0	0
105	0	0	0	1	2	0	0	0	0	0	0
106	1	1	0	0	0	0	0	0	0	0	0

ID	BIDBEC	DENSITY	VOUCHER	CERDEM	DENSITY	VOUCHER	CHAFOL	DENSITY	VOUCHER	CHAGLO	DENSITY
107	0	0	0	0	0	0	0	0	0	0	0
108	0	0	0	0	0	0	0	0	0	0	0
109_DELETED											
110	0	0	0	0	0	0	0	0	0	1	1
111	1	1	0	0	0	0	0	0	0	0	0
112_DELETED											
113	1	1	0	1	1	0	0	0	0	0	0
114	1	1	0	1	1	0	0	0	0	0	0
115	1	1	0	1	1	0	0	0	0	0	0
116_DELETED											
117	0	0	0	1	1	0	0	0	0	0	0
118	0	0	0	0	0	0	1	1	yes	1	1
119	1	1	0	0	0	0	0	0	0	0	0
120	0	0	0	0	0	0	0	0	0	0	0
121	1	1	0	1	1	0	0	0	0	0	0
122	0	0	0	1	1	0	0	0	0	0	0
123	1	1	0	0	0	0	0	0	0	0	0
124	1	1	0	1	1	yes	0	0	0	0	0
125	0	0	0	1	1	0	0	0	0	0	0
126	1	1	0	1	1	0	0	0	0	0	0
127	0	0	0	0	0	0	0	0	0	0	0
128	1	1	0	1	1	0	0	0	0	0	0
129_DELETED											
130	1	1	0	0	0	0	0	0	0	0	0
131	1	1	yes	0	0	0	0	0	0	0	0
132	0	0	0	0	0	0	0	0	0	0	0
133	0	0	0	0	0	0	0	0	0	0	0

ID	VOUCHER	ELOCAN	DENSITY	VOUCHER	HETDUB	DENSITY	VOUCHER	MYRSIB	DENSITY	VOUCHER	MYRSPI
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0
9_DELETED											
10	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	1	1	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0
20_DELETED											
21	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	1	1	0	0
23_DELETED											
24_DELETED											
25	0	0	0	0	1	1	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	1	1	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0
35	0	1	1	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0
37_DELETED											
38	0	1	1	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0	0	0
40	0	1	1	0	0	0	0	0	0	0	0
41	0	0	0	0	0	0	0	0	0	0	0
42	0	0	0	0	0	0	0	0	0	0	1
43	0	0	0	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0	0	0	0
45_DELETED											
46	0	0	0	0	0	0	0	0	0	0	1
47	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0
49_DELETED											
50_DELETED											
51	0	0	0	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0	0	0	0
53	0	0	0	0	1	1	0	0	0	0	0

ID	VOUCHER	ELOCAN	DENSITY	VOUCHER	HETDUB	DENSITY	VOUCHER	MYRSIB	DENSITY	VOUCHER	MYRSPI
54	0	0	0	0	0	0	0	0	0	0	0
55	0	1	1	0	0	0	0	0	0	0	0
56	0	1	1	0	0	0	0	0	0	0	0
57	0	1	1	0	0	0	0	0	0	0	0
58	0	0	0	0	0	0	0	0	0	0	0
59_DELETED											
60_DELETED											
61	0	1	1	0	1	1	0	0	0	0	0
62	0	1	1	0	1	1	0	0	0	0	0
63	0	0	0	0	0	0	0	0	0	0	0
64	0	0	0	0	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	0	0	0	0
66	0	1	1	0	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0	0	0	0	0
68	0	1	1	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0	1	1	0	0
70_DELETED											
71_DELETED											
72	0	1	1	0	0	0	0	0	0	0	1
73	0	0	0	0	0	0	0	0	0	0	0
74	0	0	0	0	0	0	0	0	0	0	0
75	0	1	1	0	0	0	0	0	0	0	0
76	0	0	0	0	0	0	0	0	0	0	1
77	0	0	0	0	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0	0	0	0
79_DELETED											
80	0	1	1	0	0	0	0	0	0	0	0
81	0	0	0	0	0	0	0	0	0	0	0
82	0	0	0	0	0	0	0	0	0	0	0
83	0	1	1	0	0	0	0	0	0	0	0
84	0	0	0	0	0	0	0	0	0	0	0
85_DELETED											
86	0	0	0	0	0	0	0	0	0	0	0
87	0	0	0	0	0	0	0	0	0	0	1
88	0	0	0	0	0	0	0	0	0	0	0
89	0	0	0	0	0	0	0	0	0	0	1
90	0	0	0	0	0	0	0	0	0	0	0
91	0	0	0	0	0	0	0	0	0	0	0
92	0	0	0	0	0	0	0	0	0	0	0
93	0	0	0	0	0	0	0	0	0	0	0
94	0	0	0	0	0	0	0	0	0	0	0
95	0	0	0	0	0	0	0	0	0	0	0
96_DELETED											
97_DELETED											
98	0	0	0	0	0	0	0	0	0	0	0
99	0	0	0	0	0	0	0	0	0	0	0
100	0	1	1	0	0	0	0	0	0	0	1
101	0	1	1	0	0	0	0	0	0	0	0
102	0	1	1	0	0	0	0	0	0	0	0
103	0	0	0	0	0	0	0	0	0	0	0
104	0	1	1	0	0	0	0	0	0	0	0
105	0	0	0	0	0	0	0	0	0	0	0
106	0	0	0	0	0	0	0	0	0	0	0

ID	VOUCHER	ELOCAN	DENSITY	VOUCHER	HETDUB	DENSITY	VOUCHER	MYRSIB	DENSITY	VOUCHER	MYRSPI
107	0	0	0	0	0	0	0	0	0	0	0
108	0	0	0	0	0	0	0	0	0	0	0
109_DELETED											
110	yes	0	0	0	0	0	0	0	0	0	0
111	0	0	0	0	0	0	0	0	0	0	1
112_DELETED											
113	0	0	0	0	1	1	0	0	0	0	0
114	0	1	1	0	0	0	0	0	0	0	0
115	0	0	0	0	0	0	0	0	0	0	0
116_DELETED											
117	0	0	0	0	0	0	0	0	0	0	0
118	yes	1	1	0	1	1	0	0	0	0	0
119	0	1	1	0	0	0	0	1	1	0	0
120	0	0	0	0	0	0	0	0	0	0	0
121	0	1	2	0	1	1	0	0	0	0	0
122	0	0	0	0	0	0	0	1	1	0	0
123	0	0	0	0	0	0	0	0	0	0	0
124	0	0	0	0	0	0	0	0	0	0	0
125	0	0	0	0	0	0	0	0	0	0	0
126	0	1	1	0	0	0	0	0	0	0	0
127	0	1	1	0	0	0	0	0	0	0	0
128	0	0	0	0	0	0	0	0	0	0	0
129_DELETED											
130	0	1	2	0	0	0	0	0	0	0	0
131	0	0	0	0	0	0	0	0	0	0	0
132	0	0	0	0	0	0	0	0	0	0	0
133	0	1	1	0	0	0	0	0	0	0	0

ID	DENSITY	VOUCHER	NAJFLE	DENSITY	VOUCHER	NITFLE	DENSITY	VOUCHER	POTAMP	DENSITY	VOUCHER
1	0	0	1	1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	1	1	0
3	0	0	0	0	0	0	0	0	1	1	0
4	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0
9_DELETED											
10	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	1	1	0
16	0	0	0	0	0	0	0	0	1	1	0
17	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0
20_DELETED											
21	0	0	0	0	0	0	0	0	1	1	0
22	0	0	0	0	0	1	3	yes	0	0	0
23_DELETED											
24_DELETED											
25	0	0	0	0	0	0	0	0	0	0	0
26	0	0	1	1	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0
28	0	0	1	1	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0
32	0	0	1	1	0	0	0	0	1	1	0
33	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	1	1	0
35	0	0	1	1	0	0	0	0	1	1	0
36	0	0	1	1	0	0	0	0	0	0	0
37_DELETED											
38	0	0	0	0	0	0	0	0	1	1	0
39	0	0	0	0	0	0	0	0	1	2	0
40	0	0	0	0	0	0	0	0	0	0	0
41	0	0	0	0	0	0	0	0	1	1	0
42	1	0	0	0	0	0	0	0	0	0	0
43	0	0	0	0	0	0	0	0	1	1	0
44	0	0	0	0	0	0	0	0	1	1	0
45_DELETED											
46	1	0	0	0	0	0	0	0	0	0	0
47	0	0	0	0	0	0	0	0	1	1	0
48	0	0	1	1	0	0	0	0	1	1	0
49_DELETED											
50_DELETED											
51	0	0	0	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0	1	1	0
53	0	0	1	1	0	0	0	0	0	0	0

ID	DENSITY	VOUCHER	NAJFLE	DENSITY	VOUCHER	NITFLE	DENSITY	VOUCHER	POTAMP	DENSITY	VOUCHER
54	0	0	0	0	0	0	0	0	1	1	0
55	0	0	1	1	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	1	1	0
57	0	0	1	1	0	0	0	0	1	1	0
58	0	0	0	0	0	0	0	0	0	0	0
59_DELETED											
60_DELETED											
61	0	0	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0	0	0
63	0	0	0	0	0	0	0	0	1	1	0
64	0	0	0	0	0	0	0	0	1	1	0
65	0	0	0	0	0	0	0	0	1	1	0
66	0	0	1	1	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0	0	1	1	0
68	0	0	1	1	0	0	0	0	1	1	0
69	0	0	0	0	0	0	0	0	1	1	0
70_DELETED											
71_DELETED											
72	1	0	1	1	0	0	0	0	0	0	0
73	0	0	0	0	0	0	0	0	0	0	0
74	0	0	0	0	0	0	0	0	1	1	0
75	0	0	0	0	0	0	0	0	1	1	0
76	1	0	0	0	0	0	0	0	1	1	0
77	0	0	0	0	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0	1	1	0
79_DELETED											
80	0	0	1	1	0	0	0	0	0	0	0
81	0	0	0	0	0	0	0	0	0	0	0
82	0	0	0	0	0	0	0	0	1	1	0
83	0	0	0	0	0	0	0	0	1	2	0
84	0	0	0	0	0	0	0	0	0	0	0
85_DELETED											
86	0	0	0	0	0	0	0	0	0	0	0
87	1	0	0	0	0	0	0	0	0	0	0
88	0	0	0	0	0	0	0	0	1	1	0
89	1	0	0	0	0	0	0	0	1	1	0
90	0	0	0	0	0	0	0	0	1	1	0
91	0	0	0	0	0	0	0	0	1	1	0
92	0	0	0	0	0	0	0	0	0	0	0
93	0	0	0	0	0	0	0	0	0	0	0
94	0	0	0	0	0	0	0	0	1	1	0
95	0	0	1	1	0	0	0	0	0	0	0
96_DELETED											
97_DELETED											
98	0	0	1	1	0	0	0	0	0	0	0
99	0	0	0	0	0	0	0	0	1	2	0
100	1	0	0	0	0	0	0	0	0	0	0
101	0	0	1	1	0	0	0	0	1	1	0
102	0	0	0	0	0	0	0	0	0	0	0
103	0	0	1	1	0	0	0	0	1	1	0
104	0	0	0	0	0	0	0	0	1	1	0
105	0	0	0	0	0	0	0	0	0	0	0
106	0	0	0	0	0	0	0	0	1	2	0

ID	DENSITY	VOUCHER	NAJFLE	DENSITY	VOUCHER	NITFLE	DENSITY	VOUCHER	POTAMP	DENSITY	VOUCHER
107	0	0	1	1	0	0	0	0	0	0	0
108	0	0	1	1	0	0	0	0	0	0	0
109_DELETED											
110	0	0	1	1	yes	0	0	0	0	0	0
111	1	0	1	1	0	0	0	0	1	2	0
112_DELETED											
113	0	0	0	0	0	0	0	0	1	2	0
114	0	0	1	1	0	0	0	0	1	1	0
115	0	0	1	1	0	0	0	0	1	1	0
116_DELETED											
117	0	0	0	0	0	0	0	0	0	0	0
118	0	0	1	1	0	0	0	0	0	0	0
119	0	0	0	0	0	0	0	0	0	0	0
120	0	0	0	0	0	0	0	0	0	0	0
121	0	0	1	1	0	0	0	0	0	0	0
122	0	0	1	1	0	0	0	0	0	0	0
123	0	0	1	1	0	0	0	0	1	1	0
124	0	0	0	0	0	0	0	0	1	2	0
125	0	0	0	0	0	0	0	0	1	1	0
126	0	0	0	0	0	0	0	0	1	1	0
127	0	0	0	0	0	0	0	0	1	2	0
128	0	0	0	0	0	0	0	0	1	1	0
129_DELETED											
130	0	0	0	0	0	0	0	0	0	0	0
131	0	0	0	0	0	0	0	0	0	0	0
132	0	0	0	0	0	0	0	0	1	1	0
133	0	0	1	1	0	0	0	0	1	1	0

ID	POTCRI	DENSITY	VOUCHER	POTFRI	DENSITY	VOUCHER	POTGRA	DENSITY	VOUCHER	POTPRA	DENSITY
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	1	1	0	0	0	0	0	0
3	0	0	0	0	0	0	1	1	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0
9_DELETED											
10	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	1	1	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0
20_DELETED											
21	0	0	0	1	1	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0
23_DELETED											
24_DELETED											
25	0	0	0	0	0	0	0	0	0	1	1
26	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0
30	1	1	yes	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	1	1	0	0	0
35	0	0	0	0	0	0	0	0	0	1	1
36	0	0	0	0	0	0	0	0	0	1	1
37_DELETED											
38	0	0	0	0	0	0	0	0	0	1	1
39	0	0	0	0	0	0	1	1	0	0	0
40	0	0	0	0	0	0	1	1	0	0	0
41	0	0	0	0	0	0	0	0	0	0	0
42	0	0	0	0	0	0	0	0	0	1	1
43	0	0	0	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	1	1	0	1	1
45_DELETED											
46	0	0	0	0	0	0	0	0	0	1	1
47	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0
49_DELETED											
50_DELETED											
51	0	0	0	0	0	0	0	0	0	0	0
52	0	0	0	1	1	0	0	0	0	1	1
53	0	0	0	0	0	0	0	0	0	0	0

ID	POTCRI	DENSITY	VOUCHER	POTFRI	DENSITY	VOUCHER	POTGRA	DENSITY	VOUCHER	POTPRA	DENSITY
54	0	0	0	0	0	0	0	0	0	1	1
55	0	0	0	0	0	0	0	0	0	0	0
56	0	0	0	1	1	0	0	0	0	0	0
57	0	0	0	0	0	0	0	0	0	0	0
58	0	0	0	0	0	0	0	0	0	0	0
59_DELETED											
60_DELETED											
61	0	0	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0	1	1
63	0	0	0	0	0	0	0	0	0	0	0
64	0	0	0	0	0	0	0	0	0	1	1
65	0	0	0	0	0	0	0	0	0	1	1
66	0	0	0	0	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0	0	0	0	0
70_DELETED											
71_DELETED											
72	0	0	0	0	0	0	0	0	0	0	0
73	0	0	0	1	1	0	0	0	0	0	0
74	0	0	0	1	1	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	1	1
76	0	0	0	0	0	0	0	0	0	0	0
77	0	0	0	0	0	0	0	0	0	1	1
78	0	0	0	0	0	0	0	0	0	0	0
79_DELETED											
80	0	0	0	0	0	0	0	0	0	0	0
81	0	0	0	1	1	0	0	0	0	0	0
82	0	0	0	0	0	0	0	0	0	0	0
83	0	0	0	0	0	0	0	0	0	1	1
84	0	0	0	0	0	0	1	1	0	0	0
85_DELETED											
86	0	0	0	0	0	0	0	0	0	0	0
87	0	0	0	0	0	0	0	0	0	1	1
88	0	0	0	0	0	0	0	0	0	1	1
89	0	0	0	0	0	0	0	0	0	1	1
90	0	0	0	1	1	0	0	0	0	1	1
91	0	0	0	0	0	0	0	0	0	1	1
92	0	0	0	0	0	0	0	0	0	0	0
93	0	0	0	0	0	0	0	0	0	0	0
94	0	0	0	0	0	0	0	0	0	0	0
95	0	0	0	0	0	0	1	1	0	0	0
96_DELETED											
97_DELETED											
98	0	0	0	0	0	0	0	0	0	0	0
99	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	1	1
101	0	0	0	0	0	0	0	0	0	1	1
102	0	0	0	1	1	0	0	0	0	1	1
103	0	0	0	0	0	0	0	0	0	0	0
104	0	0	0	1	1	0	0	0	0	0	0
105	0	0	0	0	0	0	0	0	0	0	0
106	0	0	0	0	0	0	0	0	0	0	0

ID	POTCRI	DENSITY	VOUCHER	POTFRI	DENSITY	VOUCHER	POTGRA	DENSITY	VOUCHER	POTPRA	DENSITY
107	0	0	0	0	0	0	1	1	0	0	0
108	0	0	0	0	0	0	0	0	0	0	0
109_DELETED											
110	0	0	0	0	0	0	1	1	0	0	0
111	0	0	0	0	0	0	1	1	0	1	1
112_DELETED											
113	0	0	0	0	0	0	1	1	0	0	0
114	0	0	0	1	1	0	0	0	0	0	0
115	0	0	0	0	0	0	1	1	0	1	1
116_DELETED											
117	0	0	0	0	0	0	0	0	0	0	0
118	0	0	0	1	1	0	0	0	0	0	0
119	0	0	0	0	0	0	0	0	0	1	1
120	0	0	0	0	0	0	0	0	0	0	0
121	0	0	0	0	0	0	0	0	0	0	0
122	0	0	0	1	1	0	0	0	0	0	0
123	0	0	0	0	0	0	0	0	0	0	0
124	0	0	0	0	0	0	0	0	0	1	1
125	0	0	0	0	0	0	1	1	yes	1	1
126	0	0	0	0	0	0	0	0	0	1	1
127	0	0	0	0	0	0	0	0	0	0	0
128	0	0	0	0	0	0	0	0	0	0	0
129_DELETED											
130	0	0	0	0	0	0	0	0	0	0	0
131	0	0	0	0	0	0	0	0	0	0	0
132	0	0	0	1	1	0	0	0	0	0	0
133	0	0	0	0	0	0	0	0	0	0	0

ID	VOUCHER	POTROB	DENSITY	VOUCHER	POTSTR	DENSITY	VOUCHER	POTZOS	DENSITY	VOUCHER	RANAQD
1	0	1	1	0	0	0	0	1	1	0	0
2	0	0	0	0	0	0	0	1	1	0	0
3	0	1	1	0	0	0	0	1	1	0	0
4	0	0	0	0	0	0	0	1	1	0	0
5	0	1	1	0	0	0	0	0	0	0	0
6	0	1	2	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	1	1	0	0
8	0	0	0	0	0	0	0	0	0	0	0
9_DELETED											
10	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	1	1	0	0
12	0	1	4	0	0	0	0	1	1	0	0
13	0	0	0	0	0	0	0	1	1	0	0
14	0	0	0	0	0	0	0	1	1	0	0
15	0	1	2	0	0	0	0	1	1	0	0
16	0	1	4	0	0	0	0	1	1	0	0
17	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0
19	0	1	2	0	0	0	0	1	1	0	0
20_DELETED					0	0	0				
21	0	1	1	0	0	0	0	1	1	0	0
22	0	1	1	0	0	0	0	0	0	0	0
23_DELETED											
24_DELETED											
25	0	1	1	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0
27	0	1	5	0	0	0	0	1	1	0	0
28	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	1	1	0	0
30	0	0	0	0	0	0	0	1	3	0	0
31	0	0	0	0	0	0	0	0	0	0	0
32	0	1	1	0	0	0	0	1	1	0	0
33	0	1	1	0	0	0	0	0	0	0	0
34	0	1	1	0	0	0	0	1	1	0	0
35	0	0	0	0	0	0	0	1	1	0	0
36	0	1	1	0	0	0	0	0	0	0	0
37_DELETED											
38	0	0	0	0	0	0	0	1	1	0	0
39	0	1	1	0	0	0	0	1	1	0	0
40	0	0	0	0	0	0	0	1	1	0	1
41	0	1	1	0	0	0	0	0	0	0	0
42	0	0	0	0	0	0	0	0	0	0	0
43	0	1	1	0	0	0	0	1	1	0	0
44	0	1	1	0	0	0	0	1	1	0	0
45_DELETED											
46	0	1	1	0	0	0	0	1	1	0	0
47	0	1	3	0	0	0	0	1	1	0	0
48	0	1	2	0	0	0	0	1	1	0	0
49_DELETED											
50_DELETED											
51	0	0	0	0	0	0	0	0	0	0	0
52	0	1	1	0	0	0	0	1	1	0	0
53	0	1	1	0	0	0	0	1	1	0	1

ID	VOUCHER	POTROB	DENSITY	VOUCHER	POTSTR	DENSITY	VOUCHER	POTZOS	DENSITY	VOUCHER	RANAQD
54	0	1	3	0	0	0	0	1	1	0	0
55	0	0	0	0	0	0	0	0	0	0	0
56	0	1	3	0	0	0	0	1	1	0	0
57	0	1	1	0	0	0	0	1	1	0	0
58	0	0	0	0	0	0	0	0	0	0	0
59_DELETED											
60_DELETED											
61	0	1	1	0	0	0	0	1	1	0	0
62	0	1	1	0	0	0	0	1	1	0	0
63	0	1	2	0	0	0	0	1	1	0	0
64	0	1	1	0	0	0	0	1	1	0	0
65	0	1	4	0	0	0	0	1	1	0	0
66	0	0	0	0	0	0	0	1	1	0	0
67	0	1	1	0	0	0	0	1	4	0	0
68	0	1	1	0	0	0	0	1	1	0	0
69	0	0	0	0	0	0	0	1	1	0	0
70_DELETED											
71_DELETED											
72	0	0	0	0	0	0	0	0	0	0	0
73	0	1	1	0	0	0	0	1	1	0	0
74	0	1	1	0	0	0	0	1	2	0	0
75	0	1	1	0	0	0	0	1	1	0	0
76	0	1	1	0	0	0	0	1	1	0	0
77	0	1	4	0	0	0	0	1	1	0	0
78	0	1	2	0	0	0	0	1	1	0	0
79_DELETED					0	0	0				
80	0	0	0	0	0	0	0	1	1	0	0
81	0	1	2	0	0	0	0	1	1	0	0
82	0	1	4	0	0	0	0	1	1	0	0
83	0	1	2	0	0	0	0	1	1	0	0
84	0	1	1	0	0	0	0	1	1	0	0
85_DELETED											
86	0	0	0	0	0	0	0	0	0	0	0
87	0	1	1	0	0	0	0	0	0	0	0
88	0	1	1	0	0	0	0	1	1	0	0
89	0	1	2	0	0	0	0	0	0	0	0
90	0	1	2	0	0	0	0	0	0	0	0
91	0	1	1	0	0	0	0	1	1	0	0
92	0	0	0	0	0	0	0	0	0	0	0
93	0	0	0	0	0	0	0	0	0	0	0
94	0	0	0	0	0	0	0	0	0	0	0
95	0	0	0	0	0	0	0	0	0	0	0
96_DELETED					0	0	0				
97_DELETED					0	0	0				
98	0	0	0	0	0	0	0	0	0	0	0
99	0	1	2	0	0	0	0	1	1	0	0
100	0	1	1	0	0	0	0	1	1	0	0
101	0	1	1	0	0	0	0	1	1	0	0
102	0	0	0	0	0	0	0	1	2	0	1
103	0	1	2	0	0	0	0	0	0	0	0
104	0	1	1	0	0	0	0	1	1	0	0
105	0	0	0	0	0	0	0	0	0	0	0
106	0	1	3	0	0	0	0	1	1	0	0

ID	VOUCHER	POTROB	DENSITY	VOUCHER	POTSTR	DENSITY	VOUCHER	POTZOS	DENSITY	VOUCHER	RANAQD
107	0	0	0	0	0	0	0	0	0	0	0
108	0	0	0	0	0	0	0	0	0	0	0
109_DELETED					0	0	0				
110	0	0	0	0	0	0	0	0	0	0	0
111	0	1	1	0	0	0	0	1	1	0	0
112_DELETED											
113	0	1	2	0	0	0	0	1	1	0	0
114	0	1	1	0	0	0	0	1	1	0	1
115	0	1	1	0	0	0	0	0	0	0	0
116_DELETED					0	0	0				
117	0	0	0	0	0	0	0	0	0	0	0
118	0	0	0	0	0	0	0	0	0	0	1
119	0	1	1	0	0	0	0	0	0	0	1
120	0	0	0	0	0	0	0	0	0	0	0
121	0	1	1	0	0	0	0	1	1	0	1
122	0	1	1	0	0	0	0	1	1	0	1
123	0	1	3	0	0	0	0	1	1	0	0
124	0	0	0	0	0	0	0	1	1	0	0
125	0	1	1	0	0	0	0	1	1	0	0
126	0	1	1	0	0	0	0	0	0	0	0
127	0	0	0	0	0	0	0	1	1	0	0
128	0	1	4	0	0	0	0	1	1	0	0
129_DELETED					0	0	0				
130	0	1	2	0	0	0	0	1	1	0	0
131	0	1	5	yes	0	0	0	1	1	0	0
132	0	1	5	0				1	1	0	1
133	0	0	0	0	1	1	yes	1	1	0	0

ID	DENSITY	VOUCHER	SAGRIG	DENSITY	VOUCHER	STUPEC	DENSITY	VOUCHER	VALAME	DENSITY	VOUCHER
1	0	0	0	0	0	0	0	0	1	1	0
2	0	0	0	0	0	0	0	0	1	1	0
3	0	0	0	0	0	1	1	0	1	2	0
4	0	0	0	0	0	0	0	0	1	1	0
5	0	0	0	0	0	0	0	0	1	1	0
6	0	0	0	0	0	1	1	0	1	1	0
7	0	0	0	0	0	0	0	0	1	2	0
8	0	0	0	0	0	0	0	0	0	0	0
9_DELETED											
10	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	1	1	0
12	0	0	0	0	0	0	0	0	1	1	0
13	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	1	2	0
16	0	0	0	0	0	0	0	0	1	2	0
17	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	1	1	0
20_DELETED			0	0	0						
21	0	0	0	0	0	0	0	0	1	4	0
22	0	0	0	0	0	0	0	0	0	0	0
23_DELETED											
24_DELETED											
25	0	0	0	0	0	0	0	0	1	1	0
26	0	0	1	1	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	1	1	0
28	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	1	1	0	1	1	0
31	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	1	1	0
33	0	0	0	0	0	0	0	0	1	1	0
34	0	0	0	0	0	0	0	0	1	2	0
35	0	0	0	0	0	0	0	0	1	2	0
36	0	0	0	0	0	0	0	0	1	1	0
37_DELETED											
38	0	0	0	0	0	0	0	0	1	1	0
39	0	0	0	0	0	0	0	0	1	2	0
40	1	0	0	0	0	0	0	0	1	2	0
41	0	0	0	0	0	0	0	0	0	0	0
42	0	0	0	0	0	0	0	0	1	3	0
43	0	0	0	0	0	0	0	0	1	2	0
44	0	0	0	0	0	0	0	0	1	3	0
45_DELETED											
46	0	0	0	0	0	0	0	0	1	1	0
47	0	0	0	0	0	0	0	0	1	1	0
48	0	0	0	0	0	0	0	0	1	2	0
49_DELETED											
50_DELETED											
51	0	0	0	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0	1	2	0
53	1	0	0	0	0	0	0	0	1	1	0

ID	DENSITY	VOUCHER	SAGRIG	DENSITY	VOUCHER	STUPEC	DENSITY	VOUCHER	VALAME	DENSITY	VOUCHER
54	0	0	0	0	0	0	0	0	1	1	0
55	0	0	0	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	1	1	0
57	0	0	0	0	0	0	0	0	1	1	0
58	0	0	0	0	0	0	0	0	0	0	0
59_DELETED											
60_DELETED											
61	0	0	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0	0	0
63	0	0	0	0	0	0	0	0	1	1	0
64	0	0	0	0	0	0	0	0	1	3	0
65	0	0	0	0	0	0	0	0	1	1	0
66	0	0	0	0	0	0	0	0	1	1	0
67	0	0	0	0	0	0	0	0	1	1	0
68	0	0	0	0	0	0	0	0	1	1	0
69	0	0	0	0	0	1	1	0	1	3	0
70_DELETED											
71_DELETED											
72	0	0	0	0	0	0	0	0	0	0	0
73	0	0	0	0	0	0	0	0	1	1	0
74	0	0	0	0	0	0	0	0	1	1	0
75	0	0	0	0	0	0	0	0	0	0	0
76	0	0	0	0	0	0	0	0	1	2	0
77	0	0	0	0	0	0	0	0	1	1	0
78	0	0	0	0	0	1	1	0	1	2	0
79_DELETED											
80	0	0	0	0	0	0	0	0	0	0	0
81	0	0	0	0	0	0	0	0	1	1	0
82	0	0	0	0	0	0	0	0	1	1	0
83	0	0	0	0	0	0	0	0	1	1	0
84	0	0	0	0	0	0	0	0	1	2	0
85_DELETED											
86	0	0	0	0	0	0	0	0	0	0	0
87	0	0	0	0	0	0	0	0	1	3	0
88	0	0	0	0	0	0	0	0	1	2	0
89	0	0	0	0	0	0	0	0	1	3	0
90	0	0	0	0	0	0	0	0	1	1	0
91	0	0	0	0	0	0	0	0	1	2	0
92	0	0	0	0	0	0	0	0	0	0	0
93	0	0	0	0	0	0	0	0	0	0	0
94	0	0	0	0	0	0	0	0	1	1	0
95	0	0	0	0	0	0	0	0	0	0	0
96_DELETED											
97_DELETED											
98	0	0	0	0	0	0	0	0	0	0	0
99	0	0	0	0	0	0	0	0	1	1	0
100	0	0	0	0	0	0	0	0	1	1	0
101	0	0	0	0	0	0	0	0	1	3	0
102	1	0	0	0	0	0	0	0	1	1	0
103	0	0	0	0	0	0	0	0	1	1	0
104	0	0	0	0	0	0	0	0	1	2	0
105	0	0	0	0	0	0	0	0	0	0	0
106	0	0	0	0	0	0	0	0	1	1	0

ID	DENSITY	VOUCHER	SAGRIG	DENSITY	VOUCHER	STUPEC	DENSITY	VOUCHER	VALAME	DENSITY	VOUCHER
107	0	0	0	0	0	0	0	0	1	1	0
108	0	0	0	0	0	0	0	0	0	0	0
109_DELETED											
110	0	0	0	0	0	0	0	0	0	0	0
111	0	0	0	0	0	0	0	0	1	1	0
112_DELETED											
113	0	0	0	0	0	1	1	0	1	1	0
114	1	0	0	0	0	0	0	0	1	1	0
115	0	0	0	0	0	0	0	0	1	1	0
116_DELETED											
117	0	0	0	0	0	0	0	0	0	0	0
118	2	0	0	0	0	0	0	0	1	1	0
119	1	0	0	0	0	0	0	0	1	1	0
120	0	0	0	0	0	0	0	0	0	0	0
121	1	0	0	0	0	0	0	0	1	1	0
122	1	0	1	1	yes	1	1	0	0	0	0
123	0	0	0	0	0	0	0	0	1	1	0
124	0	0	0	0	0	0	0	0	1	2	0
125	0	0	0	0	0	0	0	0	1	1	0
126	0	0	0	0	0	0	0	0	1	1	0
127	0	0	0	0	0	0	0	0	1	2	0
128	0	0	0	0	0	1	1	0	1	1	0
129_DELETED											
130	0	0	0	0	0	0	0	0	0	0	0
131	0	0	0	0	0	0	0	0	1	1	0
132	1	0	0	0	0	0	0	0	1	1	0
133	0	0	0	0	0	1	1	0	1	1	0

ID		
1		
2		
3	ZM	
4		
5		
6	ZM	
7	ZM	
8		
9_DELETED		
10		
11	ZM	
12	ZM	
13		
14		
15	ZM	
16	ZM	
17	ZM	
18		
19	ZM	
20_DELETED		
21	ZM	
22	ZM	
23_DELETED		
24_DELETED		
25	ZM	
26		
27	ZM	
28		
29	ZM	
30		
31		
32	ZM	
33		
34	ZM	
35	ZM	Filament. Algae Hyd?
36	ZM	
37_DELETED		
38	ZM	
39		
40	ZM	
41		
42	ZM	
43	ZM	
44	ZM	
45_DELETED		
46	ZM	
47		
48	ZM	
49_DELETED		
50_DELETED		
51		
52	ZM	
53	ZM	

ID	
54	ZM
55	100% Surface coverage of NYMODT
56	ZM
57	ZM
58	
59_DELETED	
60_DELETED	
61	ZM
62	
63	ZM
64	ZM
65	
66	
67	ZM
68	ZM
69	ZM
70_DELETED	
71_DELETED	
72	
73	ZM
74	ZM
75	ZM
76	ZM
77	ZM
78	ZM
79_DELETED	
80	
81	ZM
82	ZM
83	
84	ZM
85_DELETED	
86	
87	ZM
88	ZM
89	ZM
90	ZM
91	ZM
92	
93	
94	ZM
95	
96_DELETED	
97_DELETED	
98	
99	Filament. Algae present
100	
101	ZM
102	
103	
104	ZM
105	
106	ZM

ID	
107	
108	
109_DELETED	
110	ZM
111	
112_DELETED	
113	
114	
115	
116_DELETED	
117	
118	
119	
120	
121	
122	NYMODT?
123	
124	ZM
125	
126	
127	
128	
129_DELETED	
130	
131	
132	
133	

	BIDBEC	CERDEM	CHAFOL	CHAGLO	ELOCAN	HETDUB	MYRSIB	MYRSPI	NAJFLE	NITFLE	POTAMP	POTCRI
Total observations	22	63	1	2	26	9	4	8	29	1	53	1
Frequency	0.195	0.558	0.009	0.018	0.230	0.080	0.035	0.071	0.257	0.009	0.469	0.009
Frequency (%)	19.5	55.8	0.9	1.8	23.0	8.0	3.5	7.1	25.7	0.9	46.9	0.9
Relative frequency	0.042	0.121	0.002	0.004	0.050	0.017	0.008	0.015	0.056	0.002	0.102	0.002
Relative frequency (%)	4.2	12.1	0.2	0.4	5.0	1.7	0.8	1.5	5.6	0.2	10.2	0.2

Mean No. Taxa

4.64

	POTFRI	POTGRA	POTPRA	POTROB	POTSTR	POTZOS	RANAQD	SAGRIG	STUPEC	VALAME
Total observations	14	14	29	70	1	74	9	2	9	81
Frequency	0.124	0.124	0.257	0.619	0.009	0.655	0.080	0.018	0.080	0.717
Frequency (%)	12.4	12.4	25.7	61.9	0.9	65.5	8.0	1.8	8.0	71.7
Relative frequency	0.027	0.027	0.056	0.134	0.002	0.142	0.017	0.004	0.017	0.155
Relative frequency (%)	2.7	2.7	5.6	13.4	0.2	14.2	1.7	0.4	1.7	15.5

Mean No. Taxa

4.64

	BIDBEC	CERDEM	CHAFOL	CHAGLO	ELOCAN	HETDUB	MYRSIB	MYRSPI	NAJFLE	NITFLE	POTAMP	POTCRI	POTFRI
Total No. Observations	22	63	1	2	26	9	4	8	29	1	53	1	14
Total density	22	80	1	2	28	9	4	8	29	3	61	1	14
Average density	1.00	1.27	1.00	1.00	1.08	1.00	1.00	1.00	1.00	3.00	1.15	1.00	1.00

Overall
Mean density
3.14

	POTGRA	POTPRA	POTROB	POTSTR	POTZOS	RANAQD	SAGRIG	STUPEC	VALAME
Total No. Observations	14	29	70	1	74	9	2	9	81
Total density	14	29	124	1	81	10	2	9	117
Average density	1.00	1.00	1.77	1.00	1.09	1.11	1.00	1.00	1.44

Overall
Mean density
3.14

	BIDBEC	CERDEM	CHAFOL	CHAGLO	ELOCAN	HETDUB	MYRSIB	MYRSPI	NAJFLE	NITFLE	POTAMP	POTCRI	POTFRI	POTGRA	POTPRA	POTROB
Rothrock	10	1			3	4	7		5		10		10	7	10	10
A & S	10	1	7	4	3	5	7		5	4	7		7	5	8	10

	POTSTR	POTZOS	RANAQD	SAGRIG	STUPEC	VALAME	Csum	N	Cmean	I
Rothrock	10	8	7	10	3	7	122	17	7.2	29.6
A & S	8	4	5	8	2	4	114	20	5.7	25.5

APPENDIX F

SEVERN TRENT LABORATORY REPORTS

ANALYTICAL REPORT

Job Number: 510-2905-1

Job Description: Baetis Environmental-LaPorte, IN

For:
Baetis Environmental
2650 West Montrose Ave
Suite 307
Chicago, IL 60618

Attention: Mr. David Pott

Diana J Mockler
Project Manager I
dmockler@stl-inc.com
08/10/2006
Revision: 1

Project Manager: Diana J Mockler

Client:	Baetis Environmental
Date:	08/10/2006

General Chemistry

Method Blank Contamination

The continuing blank is greater than the reporting limit. All samples are either nondetect or 10 times higher then the blank.

Affected Items

510-2905-B-3

Batch: 510-5345
Method: 510-353.2

510-2905-B-4

Batch: 510-5345
Method: 510-353.2

510-2905-B-5

Batch: 510-5345
Method: 510-353.2

General Chemistry

MS/MSD recovery outside of control limits.

The matrix spike and matrix spike duplicate recoveries were outside of established limits. The laboratory control standard and blank were in control. The ms and msd do pass as duplicates, so the data can be reported.

Affected Items

510-2905-C-1-B

Batch: 510-5501
Method: 510-351.2

METHOD SUMMARY

Client: Baetis Environmental | Job Number: 510-2905-1

Description	Lab Location	Method	Preparation Method
Matrix: Water			
Chlorophyll-a	STL-PEN	SM20 10200H	
Residue, Non-Filterable (Gravimetric, Dried at 103-105C)	STL-VAL	MCAWW 160.2	
Nitrogen (Ammonia, Colorimetric, Automated Phenate)	STL-VAL	MCAWW 350.1	
Nitrogen, Total Kjeldahl (Colorimetric, Semi-Automated Block Digester, AAII)	STL-VAL	MCAWW 351.2	
Nitrogen, Total Kjeldahl (Colorimetric,	STL-VAL		MCAWW 351.2
Nitrogen, Nitrate-Nitrite (Colorimetric, Automated, Cadmium Reduction)	STL-VAL	MCAWW 353.2	
Determination of Phosphorus by Semi-Automated Colorimetry	STL-VAL	EPA 365.1	
Sample Digestion for Total Phosphorous	STL-VAL		MCAWW 365.2/365.3
Determination of Ortho-Phosphate by Semi-automated Colorimetry	STL-VAL	EPA 365.1	

LAB REFERENCES:

STL-PEN = STL-Pensacola
STL-VAL = STL-Valparaiso

METHOD REFERENCES:

EPA - US Environmental Protection Agency

MCAWW - "Methods For Chemical Analysis Of Water And Wastes", EPA-600/4-79-020, March 1983 And Subsequent Revisions.

SM20 - "Standard Methods For The Examination Of Water And Wastewater", 20th Edition."

METHOD / ANALYST SUMMARY

Client: Baetis Environmental

Job Number: 510-2905-1

Method	Analyst	Analyst ID
SM20 10200H	Hooe, Jennifer	JH
MCAWW 160.2	Szentsey, Amanda L	ALS
MCAWW 350.1	Ivers, Catherine L	CLI
MCAWW 351.2	Ivers, Catherine L	CLI
MCAWW 353.2	Schafer, Wendy M	WMS
EPA 365.1	Ivers, Catherine L	CLI

SAMPLE SUMMARY

Client: Baetis Environmental

Job Number: 510-2905-1

Lab Sample ID	Client Sample ID	Client Matrix	Date/Time Sampled	Date/Time Received
510-2905-1	Lily Lake	Water	07/25/2006 0800	07/25/2006 1245
510-2905-2	Clear Lake	Water	07/25/2006 0850	07/25/2006 1245
510-2905-3	Harris Lake	Water	07/25/2006 0930	07/25/2006 1245
510-2905-4	Stone Lake	Water	07/25/2006 1000	07/25/2006 1245
510-2905-5	Pine Lake	Water	07/25/2006 1025	07/25/2006 1245

SAMPLE RESULTS

Mr. David Pott
Baetis Environmental
2650 West Montrose Ave
Suite 307
Chicago, IL 60618

Job Number: 510-2905-1
Lab Sample Id: 510-2905-1
Date Sampled: 07/25/2006 0800
Date Received: 07/25/2006 1245

Client Sample ID: Lily Lake

	Result/Qualifier		Unit	RL	Method	Date Prepared	Date Analyzed	Dilution
GENERAL CHEMISTRY								
Chlorophyll a	0.57		mg/m3	0.50	10200H		07/26/2006 1025	1.0
Total Suspended Solids	11.0		mg/L	1.85	160.2		07/26/2006 1207	1.0
Ammonia, undistilled	1.56		mg/L	0.0150	350.1		07/28/2006 0947	5.0
Nitrogen, Total Kjeldahl	3.15		mg/L	0.217	351.2	07/30/2006 0740	07/31/2006 1231	1.0
Nitrogen, Nitrate Nitrite	0.0470	J B	mg/L	0.0168	353.2		07/25/2006 1718	1.0
Total Phosphorus as P	0.0700	J B	mg/L	0.0166	365.1	07/26/2006 0700	07/26/2006 1036	1.0
ortho-Phosphate	0.0460	J B	mg/L	0.0137	365.1		07/26/2006 0742	1.0

Mr. David Pott
Baetis Environmental
2650 West Montrose Ave
Suite 307
Chicago, IL 60618

Job Number: 510-2905-1
Lab Sample Id: 510-2905-2
Date Sampled: 07/25/2006 0850
Date Received: 07/25/2006 1245

Client Sample ID: Clear Lake

	Result/Qualifier		Unit	RL	Method	Date Prepared	Date Analyzed	Dilution
GENERAL CHEMISTRY								
Chlorophyll a	<0.50		mg/m3	0.50	10200H		07/26/2006 1025	1.0
Total Suspended Solids	3.70		mg/L	1.85	160.2		07/26/2006 1207	1.0
Ammonia, undistilled	0.0260		mg/L	0.00299	350.1		07/28/2006 0949	1.0
Nitrogen, Total Kjeldahl	0.889		mg/L	0.217	351.2	07/30/2006 0740	07/31/2006 1237	1.0
Nitrogen, Nitrate Nitrite	0.0480	J B	mg/L	0.0168	353.2		07/25/2006 1718	1.0
Total Phosphorus as P	0.0490	J B	mg/L	0.0166	365.1	07/26/2006 0700	07/26/2006 1039	1.0
ortho-Phosphate	0.0330	J B	mg/L	0.0137	365.1		07/26/2006 0747	1.0

Mr. David Pott
Baetis Environmental
2650 West Montrose Ave
Suite 307
Chicago, IL 60618

Job Number: 510-2905-1
Lab Sample Id: 510-2905-3
Date Sampled: 07/25/2006 0930
Date Received: 07/25/2006 1245

Client Sample ID: Harris Lake

	Result/Qualifier		Unit	RL	Method	Date Prepared	Date Analyzed	Dilution
GENERAL CHEMISTRY								
Chlorophyll a	0.90		mg/m3	0.50	10200H		07/26/2006 1025	1.0
Total Suspended Solids	68.0		mg/L	1.85	160.2		07/26/2006 1207	1.0
Ammonia, undistilled	0.0170	J	mg/L	0.00299	350.1		07/28/2006 0951	1.0
Nitrogen, Total Kjeldahl	2.00		mg/L	0.217	351.2	07/30/2006 0740	07/31/2006 1242	1.0
Nitrogen, Nitrate Nitrite	0.0220	J ^ B	mg/L	0.0168	353.2		07/25/2006 1718	1.0
Total Phosphorus as P	0.143	B	mg/L	0.0166	365.1	07/26/2006 0700	07/26/2006 1042	1.0
ortho-Phosphate	0.0500	J B	mg/L	0.0137	365.1		07/26/2006 0749	1.0

Mr. David Pott
Baetis Environmental
2650 West Montrose Ave
Suite 307
Chicago, IL 60618

Job Number: 510-2905-1
Lab Sample Id: 510-2905-4
Date Sampled: 07/25/2006 1000
Date Received: 07/25/2006 1245

Client Sample ID: Stone Lake

	Result/Qualifier		Unit	RL	Method	Date Prepared	Date Analyzed	Dilution
GENERAL CHEMISTRY								
Chlorophyll a	0.77		mg/m3	0.50	10200H		07/26/2006 1025	1.0
Total Suspended Solids	7.70		mg/L	1.85	160.2		07/26/2006 1245	1.0
Ammonia, undistilled	0.185		mg/L	0.00299	350.1		07/28/2006 0953	1.0
Nitrogen, Total Kjeldahl	0.930		mg/L	0.217	351.2	07/30/2006 0740	07/31/2006 1243	1.0
Nitrogen, Nitrate Nitrite	0.0200	J ^ B	mg/L	0.0168	353.2		07/25/2006 1718	1.0
Total Phosphorus as P	0.0640	J B	mg/L	0.0166	365.1	07/26/2006 0700	07/26/2006 1043	1.0
ortho-Phosphate	0.0440	J B	mg/L	0.0137	365.1		07/26/2006 0751	1.0

Mr. David Pott
Baetis Environmental
2650 West Montrose Ave
Suite 307
Chicago, IL 60618

Job Number: 510-2905-1
Lab Sample Id: 510-2905-5
Date Sampled: 07/25/2006 1025
Date Received: 07/25/2006 1245

Client Sample ID: Pine Lake

	Result/Qualifier		Unit	RL	Method	Date Prepared	Date Analyzed	Dilution
GENERAL CHEMISTRY								
Chlorophyll a	<0.50		mg/m3	0.50	10200H		07/26/2006 1025	1.0
Total Suspended Solids	6.10		mg/L	1.85	160.2		07/26/2006 1245	1.0
Ammonia, undistilled	0.388		mg/L	0.00299	350.1		07/28/2006 0955	1.0
Nitrogen, Total Kjeldahl	1.18		mg/L	0.217	351.2	07/30/2006 0740	07/31/2006 1248	1.0
Nitrogen, Nitrate Nitrite	<0.0168		mg/L	0.0168	353.2		07/25/2006 1718	1.0
Total Phosphorus as P	0.105	B	mg/L	0.0166	365.1	07/26/2006 0700	07/26/2006 1044	1.0
ortho-Phosphate	0.0770	J B	mg/L	0.0137	365.1		07/26/2006 0753	1.0

DATA REPORTING QUALIFIERS

Client: Baetis Environmental

Job Number: 510-2905-1

Lab Section	Qualifier	Description
General Chemistry		
	B	Compound was found in the blank and sample.
	^	ICV,CCV,ICB,CCB, ISA, ISB, CRI, CRA or MRL standard: Instrument related QC exceeds the control limits.
	F	MS or MSD exceeds the control limits
	J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

QUALITY CONTROL RESULTS

Quality Control Results

Client: Baetis Environmental | Job Number: 510-2905-1

Method Blank - Batch: 400-31517

Method: 10200H
Preparation: N/A

Lab Sample ID: MB 400-31517/1
Client Matrix: Water
Dilution: 1.0
Date Analyzed: 07/26/2006 1025
Date Prepared: N/A

Analysis Batch: 400-31517
Prep Batch: N/A
Units: mg/m3

Instrument ID: No Equipment Assigned
Lab File ID: N/A
Initial Weight/Volume:
Final Weight/Volume:

Analyte	Result	Qual	RL
Chlorophyll a	<0.50		0.50

Matrix Duplicate - Batch: 400-31517

Method: 10200H
Preparation: N/A

Lab Sample ID: 510-2905-1
Client Matrix: Water
Dilution: 1.0
Date Analyzed: 07/26/2006 1025
Date Prepared: N/A

Analysis Batch: 400-31517
Prep Batch: N/A
Units: mg/m3

Instrument ID: No Equipment Assigned
Lab File ID: N/A
Initial Weight/Volume:
Final Weight/Volume:

Analyte	Sample Result/Qual	Result	RPD	Limit	Qual
Chlorophyll a	0.567	0.767	30	24	

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: Baetis Environmental

Job Number: 510-2905-1

Method Blank - Batch: 510-5378

Method: 160.2
Preparation: N/A

Lab Sample ID: MB 510-5378/1
Client Matrix: Water
Dilution: 1.0
Date Analyzed: 07/26/2006 1207
Date Prepared: N/A

Analysis Batch: 510-5378
Prep Batch: N/A
Units: mg/L

Instrument ID: No Equipment Assigned
Lab File ID: N/A
Initial Weight/Volume: 1000 mL
Final Weight/Volume: 1000 mL

Analyte	Result	Qual	MDL	RL
Total Suspended Solids	<1.85		1.85	2.00

Laboratory Control Sample - Batch: 510-5378

Method: 160.2
Preparation: N/A

Lab Sample ID: LCS 510-5378/2
Client Matrix: Water
Dilution: 1.0
Date Analyzed: 07/26/2006 1207
Date Prepared: N/A

Analysis Batch: 510-5378
Prep Batch: N/A
Units: mg/L

Instrument ID: No Equipment Assigned
Lab File ID: N/A
Initial Weight/Volume: 250 mL
Final Weight/Volume: 250 mL

Analyte	Spike Amount	Result	% Rec.	Limit	Qual
Total Suspended Solids	401	372.0	93	80 - 120	

Calculations are performed before rounding to avoid round-off errors in calculated results.

Client: Baetis Environmental | Job Number: 510-2905-1

Method Blank - Batch: 510-5381

Method: 160.2
Preparation: N/A

Lab Sample ID: MB 510-5381/1
Client Matrix: Water
Dilution: 1.0
Date Analyzed: 07/26/2006 1245
Date Prepared: N/A

Analysis Batch: 510-5381
Prep Batch: N/A
Units: mg/L

Instrument ID: No Equipment Assigned
Lab File ID: N/A
Initial Weight/Volume: 1000 mL
Final Weight/Volume: 1000 mL

Analyte	Result	Qual	MDL	RL
Total Suspended Solids	<1.85		1.85	2.00

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: Baetis Environmental | Job Number: 510-2905-1

Method Blank - Batch: 510-5441

Method: 350.1
Preparation: N/A

Lab Sample ID: MB 510-5441/13	Analysis Batch: 510-5441	Instrument ID: Systea
Client Matrix: Water	Prep Batch: N/A	Lab File ID: N/A
Dilution: 1.0	Units: mg/L	Initial Weight/Volume:
Date Analyzed: 07/28/2006 0838		Final Weight/Volume:
Date Prepared: N/A		

Analyte	Result	Qual	MDL	RL
Ammonia, undistilled	<0.00299		0.00299	0.0200

Laboratory Control Sample - Batch: 510-5441

Method: 350.1
Preparation: N/A

Lab Sample ID: LCS 510-5441/12	Analysis Batch: 510-5441	Instrument ID: Systea
Client Matrix: Water	Prep Batch: N/A	Lab File ID: N/A
Dilution: 1.0	Units: mg/L	Initial Weight/Volume:
Date Analyzed: 07/28/2006 0836		Final Weight/Volume:
Date Prepared: N/A		

Analyte	Spike Amount	Result	% Rec.	Limit	Qual
Ammonia, undistilled	0.400	0.4090	102	75 - 125	

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: Baetis Environmental

Job Number: 510-2905-1

Method Blank - Batch: 510-5486

Method: 351.2
Preparation: 351.2

Lab Sample ID: MB 510-5486/1-A
Client Matrix: Water
Dilution: 1.0
Date Analyzed: 07/31/2006 1220
Date Prepared: 07/30/2006 0740

Analysis Batch: 510-5501
Prep Batch: 510-5486
Units: mg/L

Instrument ID: Systea 1
Lab File ID: N/A
Initial Weight/Volume: 20 mL
Final Weight/Volume: 20 mL

Analyte	Result	Qual	MDL	RL
Nitrogen, Total Kjeldahl	<0.217		0.217	0.500

Laboratory Control Sample - Batch: 510-5486

Method: 351.2
Preparation: 351.2

Lab Sample ID: LCS 510-5486/2-A
Client Matrix: Water
Dilution: 1.0
Date Analyzed: 07/31/2006 1225
Date Prepared: 07/30/2006 0740

Analysis Batch: 510-5501
Prep Batch: 510-5486
Units: mg/L

Instrument ID: Systea 1
Lab File ID: N/A
Initial Weight/Volume: 20 mL
Final Weight/Volume: 20 mL

Analyte	Spike Amount	Result	% Rec.	Limit	Qual
Nitrogen, Total Kjeldahl	5.00	4.439	89	80 - 120	

Matrix Spike/
Matrix Spike Duplicate Recovery Report - Batch: 510-5486

Method: 351.2
Preparation: 351.2

MS Lab Sample ID: 510-2905-1
Client Matrix: Water
Dilution: 1.0
Date Analyzed: 07/31/2006 1231
Date Prepared: 07/30/2006 0740

Analysis Batch: 510-5501
Prep Batch: 510-5486

Instrument ID: Systea 1
Lab File ID: N/A
Initial Weight/Volume: 20 mL
Final Weight/Volume: 20 mL

MSD Lab Sample ID: 510-2905-1
Client Matrix: Water
Dilution: 1.0
Date Analyzed: 07/31/2006 1236
Date Prepared: 07/30/2006 0740

Analysis Batch: 510-5501
Prep Batch: 510-5486

Instrument ID: Systea 1
Lab File ID: N/A
Initial Weight/Volume: 20 mL
Final Weight/Volume: 20 mL

	% Rec.						
Analyte	MS	MSD	Limit	RPD	RPD Limit	MS Qual	MSD Qual
Nitrogen, Total Kjeldahl	68	71	75 - 125	2	20	F	F

Calculations are performed before rounding to avoid round-off errors in calculated results.

Client: Baetis Environmental | Job Number: 510-2905-1

Matrix Spike/
Matrix Spike Duplicate Recovery Report - Batch: 510-5345

Method: 353.2
Preparation: N/A

MS Lab Sample ID:	510-2905-1	Analysis Batch:	510-5345	Instrument ID:	No Equipment Assigned
Client Matrix:	Water	Prep Batch:	N/A	Lab File ID:	N/A
Dilution:	1.0			Initial Weight/Volume:	10 mL
Date Analyzed:	07/25/2006 1718			Final Weight/Volume:	10 mL
Date Prepared:	N/A				

MSD Lab Sample ID:	510-2905-1	Analysis Batch:	510-5345	Instrument ID:	No Equipment Assigned
Client Matrix:	Water	Prep Batch:	N/A	Lab File ID:	N/A
Dilution:	1.0			Initial Weight/Volume:	10 mL
Date Analyzed:	07/25/2006 1718			Final Weight/Volume:	10 mL
Date Prepared:	N/A				

	% Rec.						
Analyte	MS	MSD	Limit	RPD	RPD Limit	MS Qual	MSD Qual
Nitrogen, Nitrate Nitrite	93	94	75 - 125	2	20		

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: Baetis Environmental

Job Number: 510-2905-1

Method Blank - Batch: 510-5348

Method: 365.1
Preparation: 365.2/365.3

Lab Sample ID: MB 510-5348/1-A
Client Matrix: Water
Dilution: 1.0
Date Analyzed: 07/26/2006 1013
Date Prepared: 07/26/2006 0700

Analysis Batch: 510-5369
Prep Batch: 510-5348
Units: mg/L

Instrument ID: Systea
Lab File ID: N/A
Initial Weight/Volume: 50 mL
Final Weight/Volume: 50 mL

Analyte	Result	Qual	MDL	RL
Total Phosphorus as P	0.0340	J	0.0166	0.100

Laboratory Control Sample - Batch: 510-5348

Method: 365.1
Preparation: 365.2/365.3

Lab Sample ID: LCS 510-5348/2-A
Client Matrix: Water
Dilution: 1.0
Date Analyzed: 07/26/2006 1015
Date Prepared: 07/26/2006 0700

Analysis Batch: 510-5369
Prep Batch: 510-5348
Units: mg/L

Instrument ID: Systea
Lab File ID: N/A
Initial Weight/Volume: 50 mL
Final Weight/Volume: 50 mL

Analyte	Spike Amount	Result	% Rec.	Limit	Qual
Total Phosphorus as P	2.00	1.946	97	80 - 120	

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: Baetis Environmental | Job Number: 510-2905-1

Method Blank - Batch: 510-5349

Method: 365.1
Preparation: N/A

Lab Sample ID:	MB 510-5349/13	Analysis Batch:	510-5349	Instrument ID:	Systea
Client Matrix:	Water	Prep Batch:	N/A	Lab File ID:	N/A
Dilution:	1.0	Units:	mg/L	Initial Weight/Volume:	
Date Analyzed:	07/26/2006 0740			Final Weight/Volume:	
Date Prepared:	N/A				

Analyte	Result	Qual	MDL	RL
ortho-Phosphate	0.0260	J	0.0137	0.100

Laboratory Control Sample - Batch: 510-5349

Method: 365.1
Preparation: N/A

Lab Sample ID:	LCS 510-5349/12	Analysis Batch:	510-5349	Instrument ID:	Systea
Client Matrix:	Water	Prep Batch:	N/A	Lab File ID:	N/A
Dilution:	1.0	Units:	mg/L	Initial Weight/Volume:	
Date Analyzed:	07/26/2006 0739			Final Weight/Volume:	
Date Prepared:	N/A				

Analyte	Spike Amount	Result	% Rec.	Limit	Qual
ortho-Phosphate	1.00	0.9570	96	80 - 120	

Matrix Spike/ Matrix Spike Duplicate Recovery Report - Batch: 510-5349

Method: 365.1
Preparation: N/A

MS Lab Sample ID:	510-2905-1	Analysis Batch:	510-5349	Instrument ID:	Systea
Client Matrix:	Water	Prep Batch:	N/A	Lab File ID:	N/A
Dilution:	1.0			Initial Weight/Volume:	
Date Analyzed:	07/26/2006 0744			Final Weight/Volume:	10 mL
Date Prepared:	N/A				

MSD Lab Sample ID:	510-2905-1	Analysis Batch:	510-5349	Instrument ID:	Systea
Client Matrix:	Water	Prep Batch:	N/A	Lab File ID:	N/A
Dilution:	1.0			Initial Weight/Volume:	
Date Analyzed:	07/26/2006 0745			Final Weight/Volume:	10 mL
Date Prepared:	N/A				

	% Rec.						
Analyte	MS	MSD	Limit	RPD	RPD Limit	MS Qual	MSD Qual
ortho-Phosphate	94	103	75 - 125	9	20		

Calculations are performed before rounding to avoid round-off errors in calculated results.

LOGIN SAMPLE RECEIPT CHECK LIST

Client: Baetis Environmental Job Number: 510-2905-1

Login Number: 2905

Question	T/F/NA	Comment
Radioactivity either was not measured or, if measured, is at or below background	True	
The cooler's custody seal, if present, is intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
There are no discrepancies between the sample IDs on the containers and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
VOA sample vials do not have headspace or bubble is <6mm (1/4") in diameter.	NA	
If necessary, staff have been informed of any short hold time or quick TAT needs	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	

533584

SEVERN TRENT **STL®**

STL Valparaiso
2400 Cumberland Drive
Valparaiso, IN 46383
Phone: 219-464-2389
Fax: 219-462-2953

Report To:
Contact: DAVID POTT
Company: BAETIS Environmental
Address: 2650 W. MONTROSE AVE Suite 307. CHICAGO, IL 60618
Phone: 773-463-5858
Fax: 312-262-0052
E-Mail: dpott@baetis.biz

Bill To:
Contact: SAME AS
Company:
Address: Report To
Phone:
Fax:
PO#: Quote:

Shaded Areas For Internal Use Only ___ of ___

Package Sealed: Yes (circled) No	Samples Sealed: Yes No (circled)
Received on Ice: Yes (circled) No	Samples Intact: Yes (circled) No
Temperature °C of Cooler 510-50-020: 2.6°C	
Within Hold Time: Yes (circled) No	Preserv. Indicated: Yes (circled) No NA
pH Check OK: Yes (circled) No NA	Res Cl_2 Check OK: Yes No NA (circled)
Sample Labels and COC Agree: Yes (circled) No	COC not present

2905

Sampler Name: Mitchell S. Alix
Signature: [signature]
Project Name: LaPorte LAKE
Project Number:
Project Location: LaPorte, IN
Lab PM:
Date Required — Hard Copy: __/__/__ Fax: __/__/__

Refrg #
/ Cont.
Volume
Preserv

Laboratory ID	MS-MSD	Client Sample ID	Sampling Date	Sampling Time	Matrix	Comp/Grab	Ammonia	NO2+NO3	TKN	T. Phos	O. Phos	TSS	Chlorophyll A			Additional Analyses / Remarks
2905-1		LilyLake-1A	7/25	08:00	AQ		✓	✓	✓	✓	✓	✓	✓			
-1		LilyLake-1B	7/25	08:00	AQ											
-1		LilyLake-1C	7/25	08:00	AQ											
-1		LilyLake-1D	7/25	08:00	AQ											
-2		ClearLake-1A	7/25	08:50	AQ											
-2		ClearLake-1B	7/25	08:50	AQ											
-2		Clear Lake-1C	7/25	08:50	AQ											
-2		Clear Lake-1D	7/25	08:50	AQ											
-3		HarrisLake-1A	7/25	09:30	AQ											
-3		HarrisLake-1B	7/25	09:30	AQ											
-3		Harris Lake-1C	7/25	09:30	AQ											
-3		Harris Lake-1D	7/25	09:30	AQ											

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RELINQUISHED BY	COMPANY	DATE	TIME	RECEIVED BY	COMPANY	DATE	TIME
[signature]	BNC	7-25-2006	12:45	[signature]	STL	7/25/06	12:45

Matrix Key
WW = Wastewater
W = Water
S = Soil
SL = Sludge
MS = Miscellaneous
OL = Oil
A = Air
SE = Sediment
SO = Solid
DS = Drum Solid
DL = Drum Liquid
L = Leachate
WI = Wipe
O = ______

Container Key
1. Plastic
2. VOA Vial
3. Sterile Plastic
4. Amber Glass
5. Widemouth Glass
6. Other ______

Preservative Key
1. HCl, Cool to 4°
2. H2SO4, Cool to 4°
3. HNO3, Cool to 4°
4. NaOH, Cool to 4°
5. NaOH/Zn, Cool to 4°
6. Cool to 4°
7. None

COMMENTS

Date Received / /
Courier: **Hand Delivered** ☐
Bill of Lading

533585

SEVERN TRENT **STL**®

STL Valparaiso
2400 Cumberland Drive
Valparaiso, IN 46383
Phone: 219-464-2389
Fax: 219-462-2953

Report To:
Contact: DAVID POTT
Company: BAETIS ENVIRONMENTAL
Address: 2650 W. MONTROSE AVE Suite 307. CHICAGO IL 60618
Phone: 773-463-5858
Fax: 312-362-0052
E-Mail: dpott@baetis.biz

Bill To:
Contact: SAME AS
Company: Report TO
Address:
Phone:
Fax:
PO#: Quote:

Shaded Areas For Internal Use Only ___ of ___

Package Sealed: Yes (circled) No	Samples Sealed: Yes No (circled)
Received on Ice: Yes (circled) No	Samples Intact: Yes (circled) No
Temperature °C of Cooler 510-50-020: 2.6°c	
Within Hold Time: Yes (circled) No	Preserv. Indicated: Yes (circled) No NA
pH Check OK: Yes (circled) No NA	Res Cl_2 Check OK: Yes No NA (circled)
Sample Labels and COC Agree: Yes (circled) No	COC not present

Sampler Name: Mitchell S. Alix
Signature: [signature]
Project Name: LaPorte LAKE
Project Number:
Project Location: LaPorte, IN
Lab PM:
Date Required — Hard Copy: ___/___/___ Fax: ___/___/___

Refrg # / # / Cont. / Volume / Preserv

Laboratory ID	MS-MSD	Client Sample ID	Sampling Date	Sampling Time	Matrix	Comp/Grab	Ammonia	No2+No3	TKN	T. Phos	O. Phos	TSS	Chlorophyll A			Additional Analyses / Remarks
2905-4		STONELAKE-1A	7/25	10:00	AQ		✓	✓	✓	✓	✓	✓	✓			
-4		STONELAKE-1B	7/25	10:00	AQ		✓	✓	✓	✓	✓	✓	✓			
-4		STONELAKE-1C	7/25	10:00	AQ		✓	✓	✓	✓	✓	✓	✓			
-4		STONELAKE-1D	7/25	10:00	AQ		✓	✓	✓	✓	✓	✓	✓			
-5		Pine Lake-1A	7/25	10:25	AQ		✓	✓	✓	✓	✓	✓	✓			
-5		PineLake-1B	7/25	10:25	AQ		✓	✓	✓	✓	✓	✓	✓			
-5		Pine Lake-1C	7/25	10:25	AQ		✓	✓	✓	✓	✓	✓	✓			
-5		Pine LAKE-1D	7/25	10:25	AQ		✓	✓	✓	✓	✓	✓	✓			

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RELINQUISHED BY	COMPANY	DATE	TIME	RECEIVED BY	COMPANY	DATE	TIME
[signature]	PNC	7-25-2006	12:45	[signature]	STL	7/25/06	12:45

Matrix Key
WW = Wastewater
W = Water
S = Soil
SL = Sludge
MS = Miscellaneous
OL = Oil
A = Air
SE = Sediment
SO = Solid
DS = Drum Solid
DL = Drum Liquid
L = Leachate
WI = Wipe
O = ________

Container Key
1. Plastic
2. VOA Vial
3. Sterile Plastic
4. Amber Glass
5. Widemouth Glass
6. Other ________

Preservative Key
1. HCl, Cool to 4°
2. H_2SO_4, Cool to 4°
3. HNO_3, Cool to 4°
4. NaOH, Cool to 4°
5. NaOH/Zn, Cool to 4°
6. Cool to 4°
7. None

COMMENTS

Date Received ___/___/___
Courier: Hand Delivered ☐
Bill of Lading

ANALYTICAL REPORT

Job Number: 510-4520-1

Job Description: LaPorte Lakes

For:
Baetis Environmental
2650 West Montrose Ave
Suite 307
Chicago, IL 60618

Attention: Mr. David Pott

Diana J Mockler
Project Manager I
dmockler@stl-inc.com
10/24/2006

Project Manager: Diana J Mockler

The test results in this report meet all NELAC requirements for parameters for which accreditation is required or available. Any exceptions to NELAC requirements are noted in this report. Pursuant to NELAC, this report may not be reproduced, except in full, without the written approval of the laboratory. All questions regarding this test report should be directed to the STL Project Manager who signed this test report.

Severn Trent Laboratories, Inc.
STL Valparaiso 2400 Cumberland Drive, Valparaiso, IN 46383
Tel (219) 464-2389 Fax (219) 462-2953 www.stl-inc.com

METHOD SUMMARY

Client: Baetis Environmental | Job Number: 510-4520-1

Description	Lab Location	Method	Preparation Method
Matrix: Water			
Chlorophyll-a	STL PEN	SM20 10200H	
Residue, Non-Filterable (Gravimetric, Dried at 103-105C)	STL VAL	MCAWW 160.2	
Nitrogen (Ammonia, Colorimetric, Automated Phenate)	STL VAL	MCAWW 350.1	
Nitrogen, Total Kjeldahl (Colorimetric, Semi-Automated Block Digester, AAII)	STL VAL	MCAWW 351.2	
Nitrogen, Total Kjeldahl (Colorimetric,	STL VAL		MCAWW 351.2
Nitrogen, Nitrate-Nitrite (Colorimetric, Automated, Cadmium Reduction)	STL VAL	MCAWW 353.2	
Determination of Phosphorus by Semi-Automated Colorimetry	STL VAL	EPA 365.1	
Sample Digestion for Total Phosphorous	STL VAL		MCAWW 365.2/365.3
Determination of Ortho-Phosphate by Semi-automated Colorimetry	STL VAL	EPA 365.1	

LAB REFERENCES:

STL PEN = STL Pensacola

STL VAL = STL Valparaiso

METHOD REFERENCES:

EPA - US Environmental Protection Agency

MCAWW - "Methods For Chemical Analysis Of Water And Wastes", EPA-600/4-79-020, March 1983 And Subsequent Revisions.

SM20 - "Standard Methods For The Examination Of Water And Wastewater", 20th Edition."

METHOD / ANALYST SUMMARY

Client: Baetis Environmental Job Number: 510-4520-1

Method	Analyst	Analyst ID
SM20 10200H	Hooe, Jennifer	JH
MCAWW 160.2	Finniss, Gary M	GMF
MCAWW 350.1	Ivers, Catherine L	CLI
MCAWW 351.2	Ivers, Catherine L	CLI
MCAWW 353.2	Schafer, Wendy M	WMS
EPA 365.1	Ivers, Catherine L	CLI

SAMPLE SUMMARY

Client: Baetis Environmental

Job Number: 510-4520-1

Lab Sample ID	Client Sample ID	Client Matrix	Date/Time Sampled	Date/Time Received
510-4520-1	Lower Lake	Water	10/10/2006 1130	10/10/2006 1520

SAMPLE RESULTS

Mr. David Pott
Baetis Environmental
2650 West Montrose Ave
Suite 307
Chicago, IL 60618

Job Number:	510-4520-1
Lab Sample Id:	510-4520-1
Client Matrix:	Water
Date Sampled:	10/10/2006 1130
Date Received:	10/10/2006 1520

Client Sample ID: Lower Lake

	Result/Qualifier		Unit	RL	Method	Date Prepared	Date Analyzed	Dilution
GENERAL CHEMISTRY								
Chlorophyll a	<0.500		mg/m3	0.500	10200H		10/23/2006 1630	1.0
Total Suspended Solids	50.8		mg/L	1.85	160.2		10/12/2006 1530	1.0
Ammonia, undistilled	0.126	B	mg/L	0.00299	350.1		10/11/2006 1401	1.0
Nitrogen, Total Kjeldahl	1.77	B	mg/L	0.217	351.2	10/15/2006 0815	10/15/2006 1443	1.0
Nitrogen, Nitrate Nitrite	0.0860	J	mg/L	0.0168	353.2		10/10/2006 1845	1.0
Total Phosphorus as P	<0.0166		mg/L	0.0166	365.1	10/11/2006 0840	10/11/2006 1148	1.0
ortho-Phosphate	<0.0137		mg/L	0.0137	365.1		10/11/2006 1025	1.0

DATA REPORTING QUALIFIERS

Client: Baetis Environmental　　　　Job Number: 510-4520-1

Lab Section	Qualifier	Description
General Chemistry		
	B	Compound was found in the blank and sample.
	J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

QUALITY CONTROL RESULTS

Client: Baetis Environmental | Job Number: 510-4520-1

Method Blank - Batch: 400-36788

Method: 10200H
Preparation: N/A

Lab Sample ID: MB 400-36788/1	Analysis Batch: 400-36788	Instrument ID: No Equipment Assigned
Client Matrix: Water	Prep Batch: N/A	Lab File ID: N/A
Dilution: 1.0	Units: mg/m3	Initial Weight/Volume:
Date Analyzed: 10/23/2006 1630		Final Weight/Volume:
Date Prepared: N/A		

Analyte	Result	Qual	MDL	RL
Chlorophyll a	<0.500		0.500	0.500

Duplicate - Batch: 400-36788

Method: 10200H
Preparation: N/A

Lab Sample ID: 510-4520-1	Analysis Batch: 400-36788	Instrument ID: No Equipment Assigned
Client Matrix: Water	Prep Batch: N/A	Lab File ID: N/A
Dilution: 1.0	Units: mg/m3	Initial Weight/Volume:
Date Analyzed: 10/23/2006 1630		Final Weight/Volume:
Date Prepared: N/A		

Analyte	Sample Result/Qual	Result	RPD	Limit	Qual
Chlorophyll a	0.00	0.00	NC	24	

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: Baetis Environmental

Job Number: 510-4520-1

Method Blank - Batch: 510-8034

Method: 160.2
Preparation: N/A

Lab Sample ID: MB 510-8034/1
Client Matrix: Water
Dilution: 1.0
Date Analyzed: 10/12/2006 1530
Date Prepared: N/A

Analysis Batch: 510-8034
Prep Batch: N/A
Units: mg/L

Instrument ID: No Equipment Assigned
Lab File ID: N/A
Initial Weight/Volume: 1000 mL
Final Weight/Volume: 1000 mL

Analyte	Result	Qual	MDL	RL
Total Suspended Solids	<1.85		1.85	2.00

Lab Control Spike - Batch: 510-8034

Method: 160.2
Preparation: N/A

Lab Sample ID: LCS 510-8034/2
Client Matrix: Water
Dilution: 1.0
Date Analyzed: 10/12/2006 1530
Date Prepared: N/A

Analysis Batch: 510-8034
Prep Batch: N/A
Units: mg/L

Instrument ID: No Equipment Assigned
Lab File ID: N/A
Initial Weight/Volume: 250 mL
Final Weight/Volume: 250 mL

Analyte	Spike Amount	Result	% Rec.	Limit	Qual
Total Suspended Solids	400	330.0	83	80 - 120	

Duplicate - Batch: 510-8034

Method: 160.2
Preparation: N/A

Lab Sample ID: 510-4520-1
Client Matrix: Water
Dilution: 1.0
Date Analyzed: 10/12/2006 1530
Date Prepared: N/A

Analysis Batch: 510-8034
Prep Batch: N/A
Units: mg/L

Instrument ID: No Equipment Assigned
Lab File ID: N/A
Initial Weight/Volume: 250 mL
Final Weight/Volume: 250 mL

Analyte	Sample Result/Qual	Result	RPD	Limit	Qual
Total Suspended Solids	50.80	58.00	13	20	

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: Baetis Environmental | Job Number: 510-4520-1

Method Blank - Batch: 510-7966

Method: 350.1
Preparation: N/A

Lab Sample ID: MB 510-7966/13
Client Matrix: Water
Dilution: 1.0
Date Analyzed: 10/11/2006 1336
Date Prepared: N/A

Analysis Batch: 510-7966
Prep Batch: N/A
Units: mg/L

Instrument ID: Systea
Lab File ID: N/A
Initial Weight/Volume:
Final Weight/Volume:

Analyte	Result	Qual	MDL	RL
Ammonia, undistilled	0.0100	J	0.00299	0.0200

Lab Control Spike - Batch: 510-7966

Method: 350.1
Preparation: N/A

Lab Sample ID: LCS 510-7966/12
Client Matrix: Water
Dilution: 1.0
Date Analyzed: 10/11/2006 1334
Date Prepared: N/A

Analysis Batch: 510-7966
Prep Batch: N/A
Units: mg/L

Instrument ID: Systea
Lab File ID: N/A
Initial Weight/Volume:
Final Weight/Volume:

Analyte	Spike Amount	Result	% Rec.	Limit	Qual
Ammonia, undistilled	0.400	0.4090	102	75 - 125	

LCS-Standard Reference Material - Batch: 510-7966

Method: 350.1
Preparation: N/A

Lab Sample ID: LCSSRM 510-7966/29
Client Matrix: Water
Dilution: 1.0
Date Analyzed: 10/11/2006 1407
Date Prepared: N/A

Analysis Batch: 510-7966
Prep Batch: N/A
Units: mg/L

Instrument ID: Systea
Lab File ID: N/A
Initial Weight/Volume:
Final Weight/Volume: 10 mL

Analyte	Spike Amount	Result	% Rec.	Limit	Qual
Ammonia, undistilled	1.28	1.259	98	75 - 125	

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: Baetis Environmental

Job Number: 510-4520-1

Method Blank - Batch: 510-8103

Method: 351.2
Preparation: 351.2

Lab Sample ID: MB 510-8103/1-A	Analysis Batch: 510-8109	Instrument ID: Systea
Client Matrix: Water	Prep Batch: 510-8103	Lab File ID: N/A
Dilution: 1.0	Units: mg/L	Initial Weight/Volume: 20 mL
Date Analyzed: 10/15/2006 1425		Final Weight/Volume: 20 mL
Date Prepared: 10/15/2006 0815		

Analyte	Result	Qual	MDL	RL
Nitrogen, Total Kjeldahl	0.462	J	0.217	0.500

Lab Control Spike - Batch: 510-8103

Method: 351.2
Preparation: 351.2

Lab Sample ID: LCS 510-8103/2-A	Analysis Batch: 510-8109	Instrument ID: Systea
Client Matrix: Water	Prep Batch: 510-8103	Lab File ID: N/A
Dilution: 1.0	Units: mg/L	Initial Weight/Volume: 20 mL
Date Analyzed: 10/15/2006 1430		Final Weight/Volume: 20 mL
Date Prepared: 10/15/2006 0815		

Analyte	Spike Amount	Result	% Rec.	Limit	Qual
Nitrogen, Total Kjeldahl	5.00	4.349	87	80 - 120	

LCS-Standard Reference Material - Batch: 510-8103

Method: 351.2
Preparation: 351.2

Lab Sample ID: LCSSRM 510-8103/3-A	Analysis Batch: 510-8109	Instrument ID: Systea
Client Matrix: Water	Prep Batch: 510-8103	Lab File ID: N/A
Dilution: 1.0	Units: mg/L	Initial Weight/Volume: 20 mL
Date Analyzed: 10/15/2006 1431		Final Weight/Volume: 20 mL
Date Prepared: 10/15/2006 0815		

Analyte	Spike Amount	Result	% Rec.	Limit	Qual
Nitrogen, Total Kjeldahl	4.13	3.672	89	80 - 120	

Calculations are performed before rounding to avoid round-off errors in calculated results.

Client: Baetis Environmental

Job Number: 510-4520-1

Method Blank - Batch: 510-7971

Method: 353.2
Preparation: N/A

Lab Sample ID: MB 510-7971/2
Client Matrix: Water
Dilution: 1.0
Date Analyzed: 10/10/2006 1845
Date Prepared: N/A

Analysis Batch: 510-7971
Prep Batch: N/A
Units: mg/L

Instrument ID: No Equipment Assigned
Lab File ID: N/A
Initial Weight/Volume:
Final Weight/Volume:

Analyte	Result	Qual	MDL	RL
Nitrogen, Nitrate Nitrite	<0.0168		0.0168	0.100

Lab Control Spike - Batch: 510-7971

Method: 353.2
Preparation: N/A

Lab Sample ID: LCS 510-7971/1
Client Matrix: Water
Dilution: 1.0
Date Analyzed: 10/10/2006 1845
Date Prepared: N/A

Analysis Batch: 510-7971
Prep Batch: N/A
Units: mg/L

Instrument ID: No Equipment Assigned
Lab File ID: N/A
Initial Weight/Volume:
Final Weight/Volume:

Analyte	Spike Amount	Result	% Rec.	Limit	Qual
Nitrogen, Nitrate Nitrite	1.00	1.044	104	90 - 110	

Calculations are performed before rounding to avoid round-off errors in calculated results.

Client: Baetis Environmental | Job Number: 510-4520-1

Method Blank - Batch: 510-7954

Method: 365.1
Preparation: 365.2/365.3

Lab Sample ID: MB 510-7954/1-A
Client Matrix: Water
Dilution: 1.0
Date Analyzed: 10/11/2006 1121
Date Prepared: 10/11/2006 0840

Analysis Batch: 510-7963
Prep Batch: 510-7954
Units: mg/L

Instrument ID: Systea
Lab File ID: N/A
Initial Weight/Volume: 50 mL
Final Weight/Volume: 50 mL

Analyte	Result	Qual	MDL	RL
Total Phosphorus as P	<0.0166		0.0166	0.100

Lab Control Spike - Batch: 510-7954

Method: 365.1
Preparation: 365.2/365.3

Lab Sample ID: LCS 510-7954/2-A
Client Matrix: Water
Dilution: 1.0
Date Analyzed: 10/11/2006 1124
Date Prepared: 10/11/2006 0840

Analysis Batch: 510-7963
Prep Batch: 510-7954
Units: mg/L

Instrument ID: Systea
Lab File ID: N/A
Initial Weight/Volume: 50 mL
Final Weight/Volume: 50 mL

Analyte	Spike Amount	Result	% Rec.	Limit	Qual
Total Phosphorus as P	2.00	1.938	97	80 - 120	

LCS-Standard Reference Material - Batch: 510-7954

Method: 365.1
Preparation: 365.2/365.3

Lab Sample ID: LCSSRM 510-7954/9-A
Client Matrix: Water
Dilution: 1.0
Date Analyzed: 10/11/2006 1151
Date Prepared: 10/11/2006 0840

Analysis Batch: 510-7963
Prep Batch: 510-7954
Units: mg/L

Instrument ID: Systea
Lab File ID: N/A
Initial Weight/Volume: 50 mL
Final Weight/Volume: 50 mL

Analyte	Spike Amount	Result	% Rec.	Limit	Qual
Total Phosphorus as P	3.29	3.080	94	80 - 120	

Calculations are performed before rounding to avoid round-off errors in calculated results.

Client: Baetis Environmental | Job Number: 510-4520-1

Method Blank - Batch: 510-7960

Method: 365.1
Preparation: N/A

Lab Sample ID: MB 510-7960/13
Client Matrix: Water
Dilution: 1.0
Date Analyzed: 10/11/2006 1023
Date Prepared: N/A

Analysis Batch: 510-7960
Prep Batch: N/A
Units: mg/L

Instrument ID: Systea
Lab File ID: N/A
Initial Weight/Volume:
Final Weight/Volume:

Analyte	Result	Qual	MDL	RL
ortho-Phosphate	<0.0137		0.0137	0.100

Lab Control Spike - Batch: 510-7960

Method: 365.1
Preparation: N/A

Lab Sample ID: LCS 510-7960/12
Client Matrix: Water
Dilution: 1.0
Date Analyzed: 10/11/2006 1022
Date Prepared: N/A

Analysis Batch: 510-7960
Prep Batch: N/A
Units: mg/L

Instrument ID: Systea
Lab File ID: N/A
Initial Weight/Volume:
Final Weight/Volume:

Analyte	Spike Amount	Result	% Rec.	Limit	Qual
ortho-Phosphate	1.00	0.9290	93	80 - 120	

Matrix Spike/
Matrix Spike Duplicate Recovery Report - Batch: 510-7960

Method: 365.1
Preparation: N/A

MS Lab Sample ID: 510-4520-1
Client Matrix: Water
Dilution: 1.0
Date Analyzed: 10/11/2006 1027
Date Prepared: N/A

Analysis Batch: 510-7960
Prep Batch: N/A

Instrument ID: Systea
Lab File ID: N/A
Initial Weight/Volume:
Final Weight/Volume: 10 mL

MSD Lab Sample ID: 510-4520-1
Client Matrix: Water
Dilution: 1.0
Date Analyzed: 10/11/2006 1029
Date Prepared: N/A

Analysis Batch: 510-7960
Prep Batch: N/A

Instrument ID: Systea
Lab File ID: N/A
Initial Weight/Volume:
Final Weight/Volume: 10 mL

	% Rec.						
Analyte	MS	MSD	Limit	RPD	RPD Limit	MS Qual	MSD Qual
ortho-Phosphate	97	99	75 - 125	2	20		

Calculations are performed before rounding to avoid round-off errors in calculated results.

LOGIN SAMPLE RECEIPT CHECK LIST

Client: Baetis Environmental　　　　Job Number: 510-4520-1

Login Number: 4520

Question	T/F/NA	Comment
Radioactivity either was not measured or, if measured, is at or below background	True	
The cooler's custody seal, if present, is intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
There are no discrepancies between the sample IDs on the containers and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
VOA sample vials do not have headspace or bubble is <6mm (1/4") in diameter.	NA	
If necessary, staff have been informed of any short hold time or quick TAT needs	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	

533586

SEVERN TRENT STL®

STL Valparaiso
2400 Cumberland Drive
Valparaiso, IN 46383
Phone: 219-464-2389
Fax: 219-462-2953

Report To:
Contact: DAVID POTT
Company: BAETIS ENVIRONMENTAL
Address: 2650 W. MONTRESE AVE
Suite 307 CHICAGO, IL 60618
Phone: 773-463-5858
Fax: 312-362-0052
E-Mail: dpott@baetis.biz

Bill To:
Contact: SAME AS
Company:
Address: REPORT TO
Phone:
Fax:
PO#: Quote:

Shaded Areas For Internal Use Only ____ of ____

Package Sealed: Yes **No**	Samples Sealed: Yes **No**
Received on Ice: Yes **No**	Samples Intact: **Yes** No
Temperature °C of Cooler: 13.5°C	
Within Hold Time: **Yes** No	Preserv. Indicated: **Yes** No NA
pH Check OK: **Yes** No NA	Res Cl_2 Check OK: Yes No **NA**
Sample Labels and COC Agree: **Yes** No	COC not present

4520

Sampler Name: MITCHELL S. ALIX
Signature: [signature]
Project Name: LAPORTE LAKE
Project Number:
Project Location: LAPORTE, IN
Lab PM:
Date Required — Hard Copy: __/__/__ Fax: __/__/__

Refrg # / # / Cont. / Volume / Preserv

Laboratory ID	MS-MSD	Client Sample ID	Sampling Date	Sampling Time	Matrix	Comp/Grab	Ortho Phos	Amm/TKN/TPhos	TSS/NON	Chlorophyl						Additional Analyses / Remarks
4520-1		LowerLake - 1A	10/10	11:30												
↓		LowerLake - 1B	10/10	11:30												
		LowerLake 1C	10/10	11:30												
		LowerLake 1D	10/10	11:30												

Page 17 of 17

RELINQUISHED BY [signature]	COMPANY	DATE Oct 10/06	TIME 3:20	RECEIVED BY [signature]	COMPANY STL	DATE 10/10/06	TIME 3:20
RELINQUISHED BY	COMPANY	DATE	TIME	RECEIVED BY	COMPANY	DATE	TIME

Matrix Key
WW = Wastewater
W = Water
S = Soil
SL = Sludge
MS = Miscellaneous
OL = Oil
A = Air
SE = Sediment
SO= Solid
DS = Drum Solid
DL = Drum Liquid
L = Leachate
WI = Wipe
O = ______

Container Key
1. Plastic
2. VOA Vial
3. Sterile Plastic
4. Amber Glass
5. Widemouth Glass
6. Other
______

Preservative Key
1. HCl, Cool to 4°
2. H2SO4, Cool to 4°
3. HNO3, Cool to 4°
4. NaOH, Cool to 4°
5. NaOH/Zn, Cool to 4°
6. Cool to 4°
7. None

COMMENTS

Date Received / /
Courier: **Hand Delivered** ☐
Bill of Lading

APPENDIX G

ALUM STATION OPERATIONS AND MAINTENANCE RECORDS

City of LaPorte
INDIANA
Wastewater Department

City of LaPorte
Wastewater Treatment Facility
2101 Boyd Blvd.
LaPorte, IN 46350
219-362-2354
219-362-1018 Fax

January 12, 2001

Summary of Alum Station Operation for year 2000:

The Alum station went into full operation at the end of June 2000. The following itemized list shows the operational problems that were encountered during the year and also gives a table showing the amount of treatment rendered to the storm water entering Clear Lake at this point of entry.

Operational Occurrences:

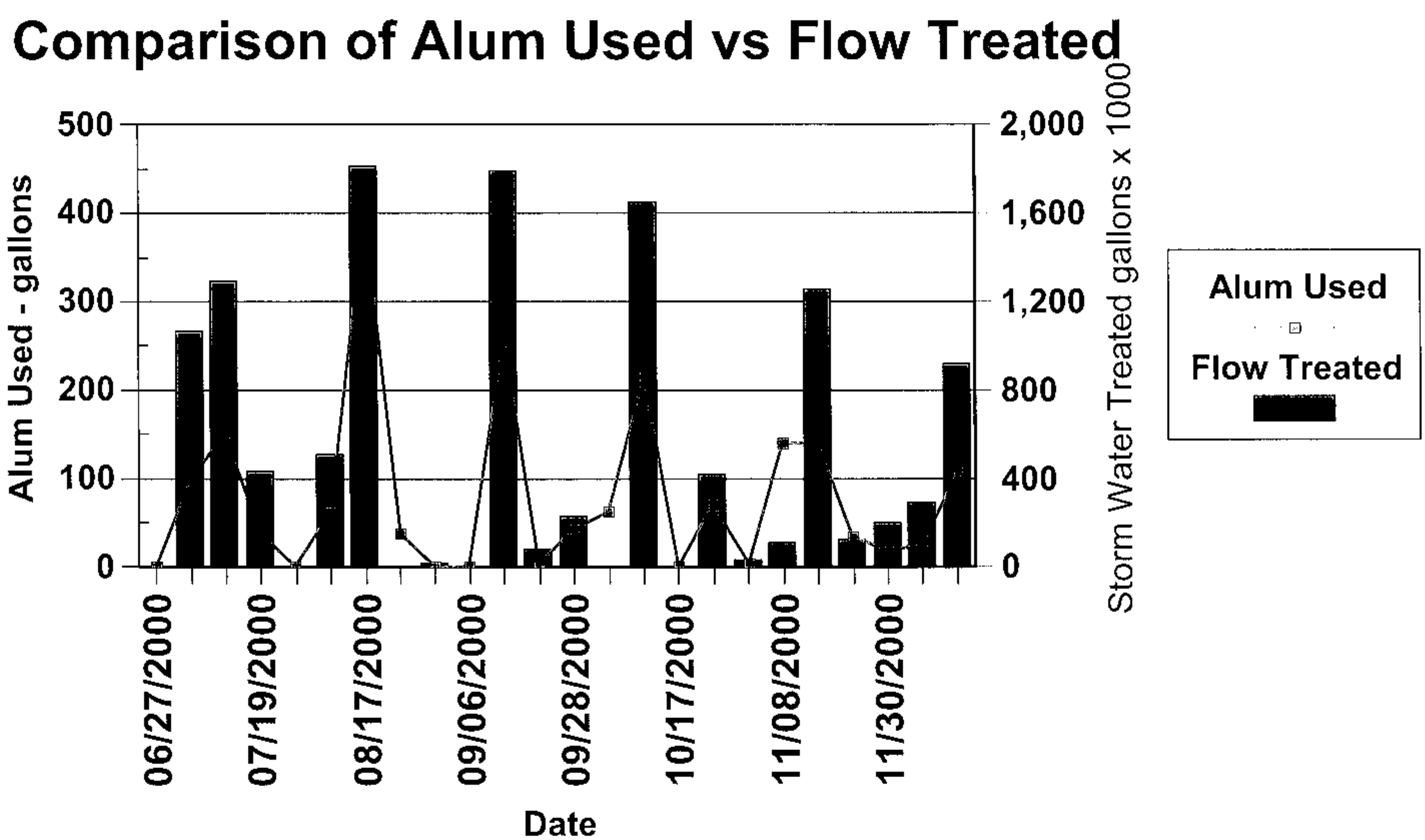
1. Paint on floor was peeling up. Tank fill piping was leaking causing alum to spill when the tank was being loaded. Both of these problems were corrected.
2. Alum Tank level measurement system was crude. An improved measurement system was created for the sight tube and put into operation, greatly improving the ability to gauge the volume of alum in the tank.
3. Check valve above pump was leaking alum, as was a valve by the discharge to the floor. These leaks were fixed.
4. Air compressor failed to start resulting in no mixing. Starter for compressor was replaced and problem disappeared.
5. Output from flow meter was recalibrated to accurately reflect 4-20mA output.
6. Water meter by door is leaking. Valve below meter was closed to prevent further leakage, but meter will need to have maintenance performed on it.
7. Pump controller is occasionally showing a pump running status when the pump is not running. This seems to be a randomly occurring event and will be difficult to track down. This affects the pump run time totalizer, minimizing the usefulness of that monitoring device.

All the incidents listed above have been corrected with the exception of items 6 and 7. These last two will corrected in the coming year.

Data from Alum station operation for 2000

Date	Alum Used gallons	Storm Water Treated gallons	Rain Monthly Total inches
06/27/2000	0	0	
07/05/2000	100	1,070,000	3.9
07/11/2000	150	1,290,000	3.9
07/19/2000	37	430,000	3.9
07/25/2000	0	0	3.9
08/01/2000	63	510,000	2.4
08/17/2000	400	1,810,000	2.4
08/22/2000	37	0	2.4
09/01/2000	0	20,000	4.7
09/06/2000	0	0	4.7
09/15/2000	260	1,790,000	4.7
09/19/2000	5	80,000	4.7
09/28/2000	43	230,000	4.7
10/02/2000	63	0	2.8
10/13/2000	215	1,650,000	2.8
10/17/2000	0	0	2.8
10/25/2000	72	420,000	2.8
11/01/2000	5	30,000	3.5
11/08/2000	140	110,000	3.5
11/15/2000	140	1,260,000	3.5
11/22/2000	35	120,000	3.5
11/30/2000	19	200,000	3.5
12/15/2000	26	290,000	
01/02/2001	108	920,000	

Total Alum Used : **1,918** gallons
Total Storm Water Treated : **12,230,000** gallons


Comparison of Alum Used vs Flow Treated
500
400
300
200
100
0
Alum Used - gallons
2,000
1,600
1,200
800
400
0
Storm Water Treated gallons x 1000
Alum Used
Flow Treated
06/27/2000
07/19/2000
08/17/2000
09/06/2000
09/28/2000
10/17/2000
11/08/2000
11/30/2000
Date

City of LaPorte
INDIANA
Wastewater Department

Status of the Clear Lake Alum Stormwater Treatment System

The Alum Treatment System located on the southwest corner of Clear Lake has been in operation since June of 2000. Its purpose is to provide additional treatment and clarification to the downtown stormwater prior to its discharge into Clear Lake. This is intended to reduce the amount of silt material accumulating in the lake which helps control the weed population and slows the natural eutrophication of the lake.

Year	2001	2002
Total gallons of Stormwater Treated:	27,610,000	27,510,000
Total gallons of Alum used in treatment:	1,962	2266

City of La Porte
INDIANA

Wastewater Department

December 5th 2003

Status of the Clear Lake Alum Stormwater Treatment System

The Alum Treatment System located on the southwest corner of Clear Lake has been in operation since June of 2000. Its purpose is to provide additional treatment and clarification to the downtown stormwater prior to its discharge into Clear Lake. This is intended to reduce the amount of silt material accumulating in the lake which helps control the weed population and slows the natural eutrophication of the lake.

Operational Concerns:

- Pump Drive Overloads

  This has been a recurring problem this year. During high flow situations the pump drive unit goes into an overload condition and stops operation, although there is no indication that the actual pump is in an overload situation. This condition is currently being fixed through the installation of a new pump drive.

The following graph shows the amount of stormwater treated (unit is gallons times 10,000) and the amount of alum used (in gallons) across the span of the 2003 year. For the 2004 year we refilled the alum tank once in May.

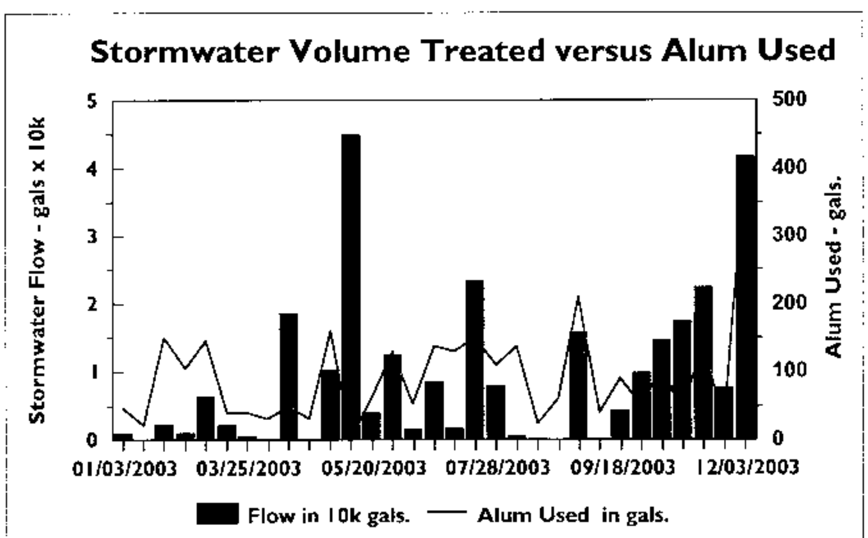
2003 Year Totals

Total gallons of Stormwater Treated:

28,130,000 gallons

Total gallons of Alum used in treatment:

2,917 gallons



City of LaPorte
INDIANA
Wastewater Department

August 2, 2006

Status of the Clear Lake Alum Stormwater Treatment System

The Alum Treatment System located on the southwest corner of Clear Lake has been in operation since June of 2000. Its purpose is to provide additional treatment and clarification to the downtown stormwater prior to its discharge into Clear Lake. This is intended to reduce the amount of silt material accumulating in the lake which helps control the weed population and slows the natural eutrophication of the lake.

Operational Concerns:

- Storage tank leakage concerns

  The alum storage tank appeared to start leaking in 2004. An effort was made to ascertain the exact location of the leak. From all appearance the leak was located by one of the front tank support legs. In order to verify this leak, in 2005 the tank was completely drained, leftover alum inside the tank was washed out and the tank was allowed allowed to dry. The tank was entered and an inspection showed that there were no cracks in the existing tank. While the tank was empty, the seepage that was assumed to be coming from the tank continued to appear on random intervals. Since the tank was empty, it was deduced that the seepage must be from ground water rising through the anchor bolt holes in the concrete floor.

- Pump Drive Overloads

  This continues to be a recurring problem. During high flow situations the pump drive unit goes into an overload condition and stops operation, although there is no indication that the actual pump is in an overload situation. This condition will hopefully be fixed through the installation of a new pump drive.

- Flow Meter Failure

  The Badger flow meter which is used to quantitatively dispense the alum has had operational difficulties during the previous year. The meter was not sending out the necessary 4-20 ma signal needed to set the injection rate of the alum. In 2006, during a storm, the flowmeter ceased to function entirely. While trying to contact the manufacturer of the meter we discovered that the meter was no longer considered serviceable. We are currently in the process of locating a replacement for the meter.

The following table shows the amount of stormwater treated and the amount of alum used across the span of the 2004 to 2006 years.

Year	2004	2005	2006
Total gallons of Stormwater Treated:	39, 360,000	94, 990,000	20,500,000
Total gallons of Alum used in treatment:	2,190	System not in operation	580*

*Flowmeter for system has failed and needs replacement per above comments.